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THE FOUNDRY

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Trade Outlook.

With many foundrymen the fuel question is becoming of even more importance than the difficulty they have been experiencing since the first of the year in finding enough iron of suitable quality to meet their requirements. The absence of the unusual supply of anthracite coal has turned coking coal as well as coke into new channels and the prices of the latter fuel have reached figures which would have been thought impossible a short time ago. For urgent delivery $10 a ton has been paid at the ovens and reports indicate that short shutdowns are being forced upon foundries in nearly every direction, particularly where melters neglected to provide for their needs earlier in the year.

Foundries may find a little consolation in the fact that furnaces have about as much trouble in securing fuel as themselves. While the producers of iron have managed to keep agoing most of the time, they have suffered serious interruptions which have been sufficient to cause irregular working of furnaces and resulted in the production of considerable off grade iron, at the same time increasing costs. Beginning with the trouble caused by the anthracite strike and the labor troubles in the Virginia and West Virginia coke regions the northern furnaces have been seriously handicapped for the want of fuel and at this writing several thousand miners in the Birmingham district have quit working, which will rapidly curtail shipments of iron from that quarter. In the absence of fuel foundries have not been so urgent of late in their demand for spot iron. The importations of foreign iron, which are coming in freely, have tended to relieve the situation not only on the Seaboard but also at interior points. Inquiries show that choice domestic brands of foundry iron are largely contracted for until the middle of 1903.

The stove industry is experiencing many cancellations of orders for base burners and the more expensive types of stoves. On the other hand the demand for oil and gas heaters is so great that it is impossible to meet the popular clamor for appliances of this character. Prices on this class of goods have advanced and the demand for temporary heating apparatus will likely continue until other fuel becomes more abundant and reasonable in prices. The agricultural implement makers are kept busy, in turn supplying the malleable iron manufacturers with all the tonnage which they are able to take care of. This branch of the foundry trade is also crowded with railroad work of all kinds owing to the unusual activity among builders of car equipment. Needless to say, in the present scarcity of rolling stock among the railroads, the car wheel makers are running to their full capacity. Taking it altogether every part of the foundry business is in elegant condition, and while complaints are heard to the effect that prices are not what they should be, the foundryman should remember that this is a feature for which legislation is within his own hands.

Peace in the Foundry Trade.

Action has been taken by the Iron Molders and Coremakers' Unions looking towards an amalgamation of their respective interests, and it is more than likely that the early part of next year will see this accomplished. While the molders have never waived their right to

make cores, or the privilege of having apprentices to their trade serve a certain length of time at core making, the forming of the core makers into a separate organization, and the trade problems confronting this, has resulted at times in generating ill feeling between the kindred trades. Being by the nature of their calling compelled to work practically under one roof, friction between the molders and core makers has nearly always resulted in the foundryman being injuriously affected, and while the latter has at times invited this by having dealings with one organization and refusing similar treatment to the other, there is no doubt but that it would be of benefit to the foundrymen if their foundry labor could be centralized under one responsible head. Much greater harmony would prevail and the questions of wages and shop conditions could be much more easily disposed of. It may be urged that placing the two trades under one head would increase the power wielded by one party, yet it has been the experience in nearly every industry that it is far easier to deal with one large organization than a number of smaller ones. As for the core makers they could not help but be benefited under the jurisdiction of the molders, as it is well known that in very many localities they are not considered of importance by the foundrymen and are unable to muster sufficient force to secure what at times rightfully belongs to them as a skilled class of workmen. There is every reason why all connected with molding and core making in any form should be allied under one organization, and if this shall have intelligent and reasonable officers to look after its affairs advantages will accrue to the employer as well as the employe.

The Foundry Foreman.

In the first place a foreman's word should be as good as his bond. While he should at all times look after the interest of the firm who employs him, he should also be fair in all his dealings with the men in his charge. In other words he should not show partiality at any time nor try to make fish of one man and fowl of another. The ideal foreman should at all times be an example for others both in the shop and out of it. A foreman should not make promises when he fears he may be compelled to break them, nor should he give a discourteous reply to anyone, as a civil question at least deserves a civil answer.

Above all things a foreman should not lose his temper, and while it is of course pretty hard to observe this rule at all times and under some circumstances, especially when it seems like everything is going wrong, he should bear in mind that the man who can keep a cool head as a rule comes out victorious. A foreman should also strive to be a gentleman; there are too many in the trade who seem to think that doing considerable swearing and bluffing will help them along, but such is not the case. They act as if they believe that unless they utter an oath every time they give an order that this will not have the weight it should, but this is beyond a doubt a gross mistake. In the first place a foreman lowers his dignity by using profane language, and besides he can tell the man whom he is addressing much better what he wants him to understand in plain language and few words. It has been my experience that a few words spoken at the right time carry a great deal more weight than a blustering order given in the heat of passion. The trouble is that some men cannot be given a little authority without abusing it. A foreman can treat the men under him fair and honest and still look after the interest of the firm at the same time.

By dealing fairly with the men under him he gains their confidence and they will not always be looking for a chance to take advantage of the firm or foreman at every opportunity that avails itself. I have known foremen to hold malice against excellent workmen and refuse to hire them for some personal reason, and this, perhaps, at a time when the firm was very much in need of molders of the best kind. A foreman who will permit such things to be done is not looking out for the firm's interest, but standing out against it. If a molder is a first class workman and a steady man the foreman should overlook considerable. Another thing some foremen should try to overcome is to think that they are the only ones in the business who know anything about a foundry, for in very many cases, what such a foreman does not know would make a much larger book than one of what he does know.

At all times when a suggestion is made of other methods of doing a job, or anything pertaining to foundry practice in general, the foreman should not fail to pay strict attention thereto and accept it for what it is worth, since sometimes traveling molders run up against good ideas. Where a foreman stays in one shop for a great many years there is a danger of him getting into a rut which he should by all means avoid, and the only way to obviate this is to strive to keep up with the times by

learning what others are accomplishing. If a foreman neglects to post himself the firm by whom he is employed will lose in the end, as he will also himself.

Lastly, a foreman's treatment of apprentices should be fair and he should give them all the chances possible if they are getting along well and doing good work, because they deserve to be encouraged. An apprentice should be complimented when he does good work and at the same time he should be cautioned against becoming careless. The fault with most firms is that they are not careful enough about selecting their apprentices or inquiring into their character and habits. Those who learn the trade should be given a short trial before being permanently engaged and if not found to be made of the right material they should be let go, as it would be an unkind act to keep them at a trade for which they are not fitted. I believe that if all foundrymen would make an effort to raise the standard of molders that the result would be gratifying. We would then have a better class of molders and would not be burdened with so many workmen who are of no account, the kind that are of little force and as soon as payday comes around pack up their belongings and skip. They do not even inform their foreman that they are going to quit but simply disappear. Complaints are often made that many molders drink more than they should and that it is quite natural for an apprentice to fall in their footsteps, and while admitting that environments have much to do with influencing the apprentice, yet I believe that this state of affairs can be changed if an earnest attempt is made to bring about better conditions.

J. O. LITTLE.

Duties of a Foundry Chemist.

In my investigation of practical foundry chemistry I endeavored to ascertain what the duties of a chemist were, and found that in many foundries in which chemists had been but recently employed their duties had not been fully defined and in others they varied to a considerable extent with the class of castings produced. At one large engineering works at which a chemist had been employed for many years I found his duties to be about as follows: He had full charge of the cupolas and melting and was required to reduce the cost of melting to a minimum, to determine the best material for lining, daubing, etc., to analyze all fuel and see that nothing but that giving best results in melting was purchased and used and to see that iron was properly and economically melted.

He was required to analyze all iron melted and to make mixtures that would produce at the spout an iron of any desired quality and to familiarize himself with analyses of all the various irons in the market and price of same.

When specifications were received for castings he was required to state definitely whether or not he could produce an iron having the characteristics called for therein; if so, the amount of various brands of iron required and cost of mixture. To make all tests of tensile and transverse strength, deflection, etc., required, and to see that the iron was at all times fully up to requirements of the foundry, and in case of special castings to produce an iron called for in the specifications, meet and overcome all trickery and ignorance of civil engineers in testing and construction of castings.

He is required to give in advance shrinkage of various mixtures for the construction of patterns and to state from outlines on blue prints if castings can be made from required mixtures without undue strain, hardness or softness in any part of it. In addition to his responsibility for quality of iron, he is required to see that facing, blacking, sand and all foundry supplies are fully up to the requirements of the foundry, that castings may not be lost from bad material.

This may seem an elaborate amount of work to the young chemist, but it represents only about one-tenth of the work a practical founder has been accustomed to do for years, and the chemist is given only this small part of the work, that he may be able to look after its details more closely than the busy founder and obtain better results. He will not find it an excessive amount of work when he has once familiarized himself with its details.

EDWARD KIRK.

Stevens & Blume, of Detroit, Mich., have prepared plans for a two-story brick addition, 55x60 feet in size, to the factory of the Detroit Brass Works. An addition, 40x140 feet in size, with high trussed roof, designed by the same architects, has just been completed under their supervision, giving about 10,000 square feet of additional floor space. It is designed with especial reference to furnishing abundant light and thorough ventilation. The plans provide for a complete equipment of approved machinery in accordance with the most advanced ideas.

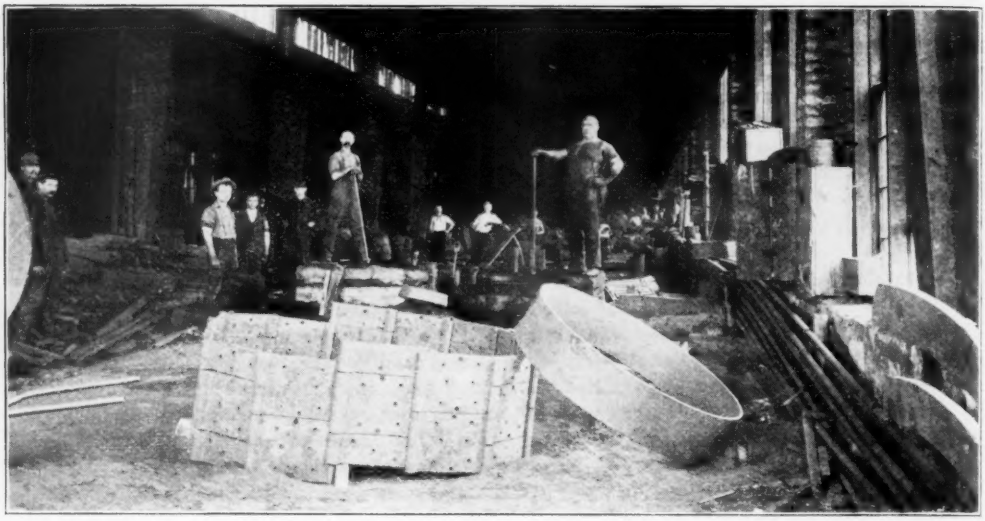


FIG. 1. SIDE FLOOR IN THE FILER & STOWELL FOUNDRY, SHOWING LINKED CURBING IN THE FOREGROUND.

The Filer & Stowell Co.'s Foundry, Milwaukee.

In point of number of iron foundries the cities of Cleveland and Milwaukee are tied for fifth place, although when tonnage is considered both are undoubtedly ahead of Brooklyn, their next competitor. It is not alone in the production of gray iron castings that Milwaukee excels for that city also contains within its borders five shops where steel castings are made and another is in the course of construction in addition to which there are four malleable foundries with two new concerns in this line projected. Taking all in all Milwaukee may well claim to be one of the leading foundry centers in the world and it can rightly boast of having some of the largest and most modern foundries to be found anywhere, shops which are turning out the heaviest class of castings and equipped with the best appliances that money can buy.

It is particularly in the line of engine castings that the Milwaukee foundries have secured a reputation which extends among the trade throughout the country. As builders of Corliss engines the Filer & Stowell Co. ranks well to the front in the western contingent of manu-

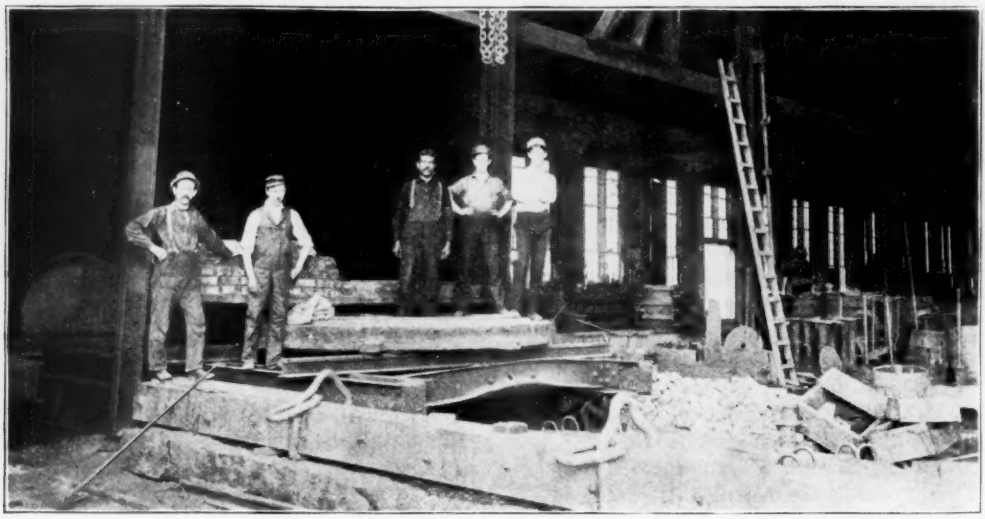


FIG. 2. LOAM FLOOR AND OVEN IN THE FILER & STOWELL FOUNDRY.

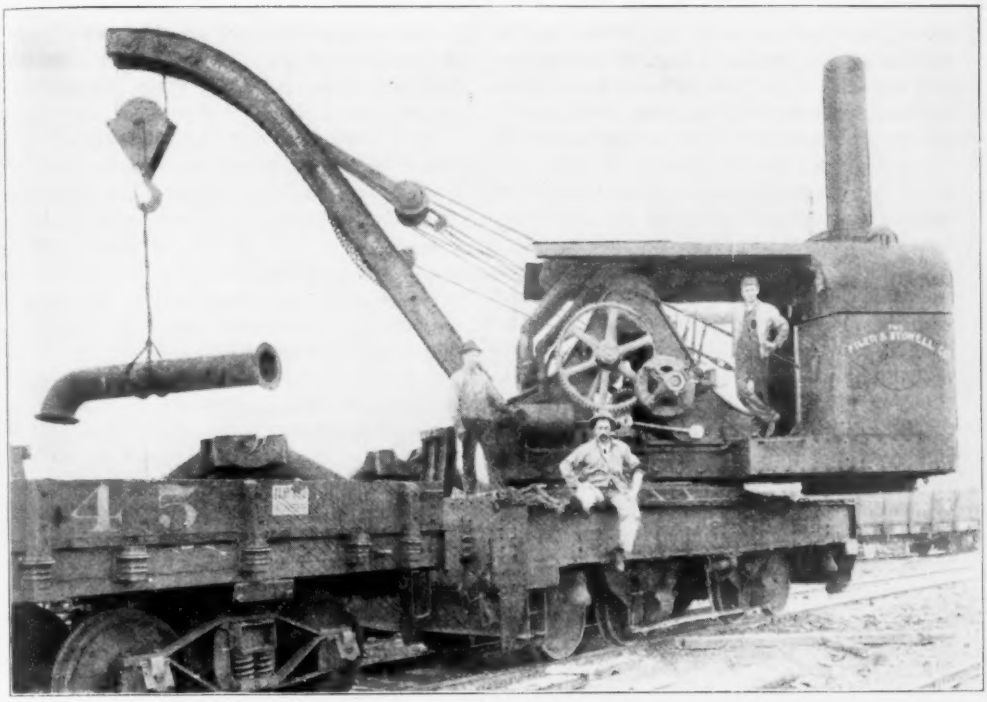


FIG. 3. TRAVELING STEAM DERRICK FOR HANDLING CASTINGS AT THE FILER & STOWELL FOUNDRY.

facturers of this class of machinery. At the present time they have under construction a number of Corliss engines, the frames of which, with slides attached, weigh 35 tons; fly wheels weighing as high as 70 tons are also being turned out.

The present foundry of the Filer & Stowell Co. is 350 feet long with a center span of 40 feet, served by three 30-ton electric traveling cranes. On both sides of the main part of the foundry and extending the full length thereof are side floors having a span of 30 feet. One of these side floors has a 20-ton electric traveling crane covering its full length while the opposite side floor is partly occupied by the core room and cupolas of which there are two having a melting capacity of nine and seventeen tons per hour. In this part of the foundry are also located the molding floors for the lighter class of castings and the pulley molding machines.

At the present time the Filer & Stowell Co. are purchasing from outside concerns nearly as many castings as they produce themselves, and in order to meet the increased demand for castings in their machine shop they are now having prepared plans for a new foundry to be 400 feet in length with provision for further extensions

A CONTRAST IN MOLDERS TO BE SEEN AT THE FILER & STOWELL FOUNDRY.

should such become necessary. There will be two bays, each having a span of 80 feet and one bay with a span of 50 feet. Each of the main departments will have two 30-ton cranes while a 20-ton crane will serve the smaller bay.

Fig. 1 gives a general view of the side floor. In the foreground is shown some of the linked curbing employed in this shop which forms a handy method of securing large molds. Fig. 2 is a view of the loam floor and oven which is twenty-five feet square and has a double track with two steel cars. The center column of the oven is movable so that large molds may be placed on both cars if necessary. For distributing castings to the various departments the traveling steam derrick shown in Fig. 3 is employed and the company are now having a switch engine built so that its shipping department may be served with greater dispatch.

In the foundry department of the Filer & Stowell Co. is to be seen one of the largest molders in the country who follows his occupation day after day. Mr. Con Tobin measures six feet and one and a half inches in height and tips the scale at 344 pounds. History does not say whether he has made away with more than his share of the stuff which made Milwaukee "famous," but at any rate he has the reputation of putting up a remarkably big day's work and of getting around in a surprising lively manner. As a contrast to Mr. Tobin the Filer & Stowell foundry also contains Mr. Emil J. Chester, who only reaches five feet and one-half inch above the floor level and owns up to the fact that there is only 110 pounds of him, at the same time there is but little doubt that Mr. Chester can make much larger molders hustle to keep up with him.

The Filer & Stowell Co. purchase all irons upon a guaranteed chemical analysis and use this as a basis for whatever mixtures it is desired to employ. The cost of producing castings as well as the loss from defective castings has been reduced to a surprisingly low minimum. The foundry is operated under the direction of Mr. John Reardon.

EDWARD B. GILMOUR.

Mixing Iron for Small to Medium Large Size Machinery Castings.

The controlling factors in mixing iron for the various classes of work it is used for, are its five main constituents, carbon in two forms, combined and free carbon; silicon; sulphur; phosphorus and manganese. The pure iron without them would be of no service.

Different percentages of these constituents in combination with the iron make it suitable for the three principle kinds of castings; namely, stove plate; machinery and car wheels.

The exact *quantity* and *influence* of each constituent, in combination with the iron, are known and easily obtained. The first from the sellers of pig iron, who furnish the analysis of the iron with each purchase, and the second from chemists. And as the iron market offers a great variety of brands with various proportions of the constituents, the writer can see no good reason why a foundryman should not be able to manipulate his mixtures of iron to suit his class of castings.

There is no one brand of pig iron that will answer for the variety of needs in its class with the scrap iron that usually has to be mixed with it. For instance, take machinery with its various requirements, and it is obvious that the only solution to get what is wanted, is in mixing together scrap and pig iron that will give the proper proportions of the needed constituents to meet the requirements of this class of castings.

Those who have not the opportunity to study this matter, naturally ask for some definite rule to work by, but do not often get it, as writers, on the mixing of iron are shy about giving exact information or rules on the subject. One reason for this is the fact that conditions in foundries vary very much in material, cupolas and other things aside from the iron that is used in making castings and all have a bearing on the product. But there are mixtures of iron that these conditions will not materially alter.

I find that this is true from a very large experience in mixing iron in different foundries, and give with this my method of mixing iron for one class of machinery castings, that is based on the percentage of three of the constituents of iron, combined carbon, free carbon and principally that of silicon, as the latter is the main factor in maintaining a standard of iron, from various proportions of pig and scrap iron, in foundries making small to medium large size machinery castings, and who have the inevitable miscellaneous scrap pile, which furnishes from one-third to two-thirds of all the iron melted, as the owners generally wish to keep on good terms with the machine shops and therefore take their scrap in trade.

The first question asked by those not familiar with mixing iron, is what is needed in pig iron to carry a certain amount of scrap for a special class of castings. My answer to this

question is, that pig iron with about 3 per cent free carbon and 2½ per cent silicon, will carry one-third scrap, if the latter is nearly free from steel and wrought iron, and make soft, strong and clean castings.

The next question is, how am I to maintain that standard, if by chance or design the pig iron falls short in free carbon and silicon, or if I wish to reduce the pig and increase the scrap in my mixture and still keep up the standard? My answer is, that this can be done by the use of ferro-silicon pig iron.

A few words in regard to silicon and its influence and action on iron, and some of its other constituents, are necessary in order to understand its usefulness and limit in helping to produce soft, strong and clean castings in this class, which may be summed up as follows:

Silicon combines with iron up to about 33 per cent, and when used within a certain limit will increase fusibility, lessen shrinkage and the formation of blow holes; it tends to neutralize sulphur, phosphorus and manganese, and changes combined carbon to free carbon. Ferro-silicon pig is not strong when over 5 per cent, and when over 10 per cent is hard and brittle, conclusively showing that this element when high does not soften or strengthen iron.

Chemical tests and practical use prove that silicon gives strength and softness to iron, by its chemical action on combined carbon in pig or scrap iron, changing a large portion of this to free carbon when the iron is being melted, and that any large quantity over the necessary amount to accomplish this simply reproduces a ferro-silicon iron and defeats the purpose for which it is employed.

From 2 to 3 per cent will change all the combined carbon in pig, that can be changed, and about the same in scrap, which is the extreme limit of its usefulness in getting soft, strong and clean castings.

Practical foundrymen understand that when castings are light, the sand surfaces of the molds are close together and act as a chill to the iron and require very soft iron, which can be obtained by using two-thirds pig and one-third scrap, as stated. When the castings increase in thickness and weight, better results are gained by reducing the pig and increasing the scrap in the mixture. Right here is where silicon as a regulator becomes invaluable, in keeping mixtures very close to a standard iron that will give good results in the castings, if the following rule is carefully followed:

Allow about 2½ per cent free carbon and 2 per cent silicon in miscellaneous scrap iron, if of fair size and add to the mixture, silicon from ferro-silicon pig in such amounts as the iron may be lacking in free carbon and silicon, to bring it up to the standard.

STANDARD.

Free Carbon:	
Pig iron, 800 lbs., 3 per cent.....	24
Scrap iron, 400 lbs., 2½ per cent..	10
Silicon:	
Pig iron, 800 lbs., 2½ per cent....	20
Scrap iron, 400 lbs., 2 per cent....	8
Total	62

If the scrap is light and poor, allow 2 per cent free carbon and 2 per cent silicon. Silicon too freely used will fail in producing good results.

P. BURKE.

Foundry Progress in Great Britain.

In recent issues of THE FOUNDRY there have appeared articles on British foundry practice, and to those not acquainted with the peculiarities of the trade in our country the only impression to my mind which they can form is, that if ever Britain had a prestige in the art of founding, the same has long ceased to exist.

WM. ROXBURGH.

Some of the reasons assigned for our so-called falling behind are of the usual stock in trade complaints which refer to our laxity in adopting what is usually known as Modern Foundry Practice, and which may be said to include such features as machine and plate molding, follow boards, snap flasks, etc.

Doubtless those who hold the opinion that we are not up to date have good ground for their convictions and are entitled to their views, but even to the more neutral person, who knows for a fact that shipbuilding in Great Britain exceeded one and one-half million tons in 1901, an output which is larger than that of her two greatest rivals in the world combined, it must be apparent that no loss of prestige can have taken place in her trade in marine castings.

In these remarks I shall confine myself principally to the foundry trade of Scotland, and more so to the immediate neighborhood of Johnstone, where former articles appearing in THE FOUNDRY originated. As far as machine molding is concerned I unhesitatingly assert that we can never lead the way in the marine trade. More than half the British shipbuilding industry centers right on the Clyde, and such being the case it is evident that there can be but little room for machine molding in this part of the country and that this must be found outside of marine castings. I am certain that Scotland has not been slow in adopting new methods and appliances which tend to increase the output of the foundry. In the town from which I am writing this I know there have been molding machines at work for more than 30 years, and from the progressive character of the firm I am certain that they have adopted molding machines for every class of work in which they have proved themselves available.

Then again, there is the great Singer Mfg. Co., at Kilbowie, not a dozen miles from Johnstone, where hydraulic molding machines have been used on a very extensive scale for something like 20 years, and even a person who is very much biased against the use of molding machines is likely to have his opinions changed through a visit to this plant. Indeed it would be difficult to find a class of work more suitable to modern methods of producing light castings. The ease with which I observed these machines, snap flasks, etc., manipulated many years ago and the superior quality of the castings here turned out has long since demonstrated the superiority of the molding machine in these works.

As another instance tending to show that the British foundrymen are not anywhere near as far behind as some people would like to have others believe, I will mention the British Hydraulic Foundry Co., at Whiteinch, just a few miles from here, which started operations ten or twelve years ago with a capital of over 150,000 pounds sterling. This plant is equipped with everything catalogued in modern foundry practice, and for completeness of equipment it would be difficult to imagine anything to surpass it. And as if to crown everything modern, female labor was introduced in the core making establishment, which was said to be the first instance of the kind in Scotland, and is in practice to this day.

The examples to which I have referred should prove that for light castings wanted in large quantities, we, in this part of the west of Scotland, are not so very far behind our neighbors, and if there are some who are just waking up to the fact that these things exist, it is evident that they are a generation behind in the art of molding as now practiced in this part of the world.

Then with regard to what is said about modern cupola practice, one is often tempted to regard this as mythology, because every practical man studies this question, and we are the more amazed whenever we hear of an odd one now and then falling into the trap of some would-be cupola patentee, with the result that in a short time he practically comes back to the method of cupola melting practiced by our forefathers over 50 years ago, and at what cost does he obtain this experience? We admit that Scotland has been slow in buying some of the patented cupolas, for which great claims have been made, but our experience has proved her to be correct in this, as there has yet to be seen the cupola which can show any improvement or economy over the old style.

Passing from the field of light castings and the methods of turning out these, much might be said about the practice in vogue in works making land and marine engine castings in this part of the world, still the fact that engines of 30,000 I. H. P. are being built on the Clyde shows that nowhere in the world should the brain power of the molder be developed to a greater extent than right here on the Clyde. This is simply the outcome of conditions peculiar to the engineering wants of the country. Further it is to Scotland, as far as it is known, that the premier position belongs of having produced the heaviest casting during the nineteenth century. This is an anvil block cast at the works of the Kilbirnie Iron & Steel Co., which weighs 180 tons.

It has been my desire in this article to remove the impression that British foundries are opposed to progress. Such is not the case and all those who want to help us need to do, is to show us that their inventions are of practical value and not theoretical.

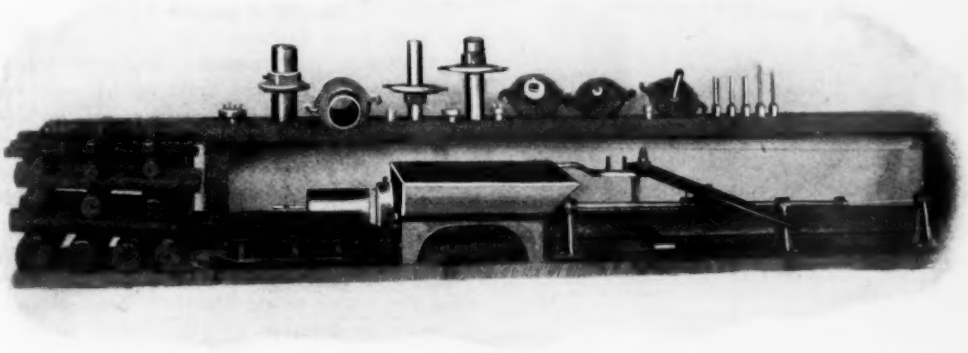
Kilmarnock, Scotland. WM. ROXBURGH.

The Rock Island Iron Works, operated by Morris & Lewis, are having plans prepared for a machine shop 80x300 feet and a foundry 40 x100 feet.

The Rochester Iron Works, Lull & Marquardt, proprietors, Rochester, Minn., are erecting a brick building to be used for foundry purposes.

The Pyott Core Machine.

That interest in mechanical appliances for turning out cores, as well as molds, is on the increase is proven by the number of new machines for both purposes, of which descriptions have recently appeared in these columns. Nor is it to be gainsaid that wherever it is practicable to adopt machines for making cores there is a distinct saving which rapidly increases as the volume of cores consumed by the foundry becomes larger. Then there is a lack of uniformity in cores that are pasted together in halves, which is annoying to the manager who insists on perfectly cored holes in castings and desires to avoid machine work as much as possible where this is not absolutely necessary. As far as perfect venting is concerned the advantage lays directly with the machine made core.



THE PYOTT CORE MACHINE.

Among the latest appliances designed to facilitate the making of cores is the machine shown in the accompanying illustration which is the invention of James M. Pyott, Jr., of Holmes, Pyott & Co., Chicago. It differs from other core machines in that it is operated with a lever and the core squeezed through the dies instead of being turned out by a rotary motion. There are no gears employed in the construction of the Pyott core machine, which will make cores from three-eighths of an inch up to four inches in cross section of any length and shape required. It is also claimed that with this machine, which may be operated by either hand or power, a core may be made of different degrees of hardness to conform to the sand mixture employed and the conditions under which the core is to be used.

In operation the basin is filled with core sand and the handle worked backward and forward, actuating a plunger which forces the core through the die and at the same time automatically forming the vent-hole. As the core leaves the die it is received upon a plate conforming to its shape and may there be cut into suitable lengths. If it is desired to strengthen the core, the machine is so arranged that wires may readily be inserted as the core is being made. The Pyott core machine weighs about 30 pounds without dies. With a complete set of these this is increased by about a hundred pounds. George W. Pyott, 72 North Sangamon St., Chicago, is manufacturing these machines for the trade.

Hart's Device for Stopping Runouts.

With proper flasks and a molder who knows his business, runouts ought not to occur very often, in fact there is hardly a competent mechanic who will defend them. Even where a flask with burned joints is employed it devolves upon the molder to take such precautions as will prevent a runout from taking place. Nevertheless we all know that some foundries are bothered from one end of a heat to the other by molds giving away when being

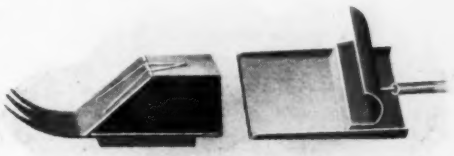


FIG. 1. FIG. 2.

HART'S DEVICE FOR STOPPING RUNOUTS.

poured and for this reason a device for plugging up runouts designed by Edward Hart, of Montgomery, Ohio, a suburb of Cincinnati, will be of interest.

Mr. Hart's invention is made in two forms, shown in Figs. 1 and 2. Fig. 1 is provided with a handle the same as Fig. 2 and is intended for use on side floors, where there are but a

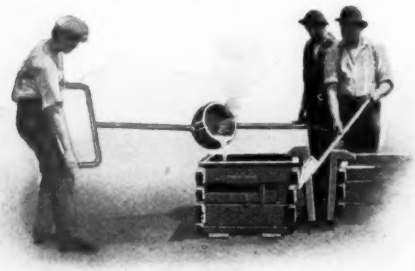


FIG. 3. USING HART'S DEVICE. SHOWN IN FIG. 1.

few inches of space left between the flasks, its application being shown in Fig. 3. It is provided with a boxlike receptacle, which is filled with sand in such a manner that this can not fall out and enter the gates of the mold or do damage in other ways, when it becomes necessary to stop a runout. The stopper is filled

FIG. 4. STOPPING A RUNOUT WITH DEVICE SHOWN IN FIG. 2.

with molding sand after it has been dipped in claywash, to prevent the lips from being burned off when in use. It is then placed at a convenient point to the floor on which pouring is goin on, where it is ready for instant use. When a runout occurs the lip of the stopper is placed in the joint of the flask and through a device connected with the handle sand is rammed solidly into the joint, effectually blocking the opening through which the iron is escaping.

Fig. 2 is intended for use on the larger class of molds, where there is more room to work in than is the case with the smaller class of castings; Fig. 4 represents the method of using this form of stopper. When there is a runout one picks up the stopper and loads it with sand, afterwards placing it against the joint, where as previously explained the sand is packed solidly into the opening. Doubtless every molder will recall the times he has tried to stop runouts by holding sand against the side of the flask, only to find in the majority of cases that the pressure of the iron within the mold was sufficient to force the iron through the loose sand banked against the exterior of the mold. If only a small part of the sand could have been rammed tightly into the opening, the runout would soon have been stopped. The device designed by Mr. Hart is intended to do this and we understand from experiments made at the Norwood (Cincinnati) plant of the Hoefinghoff & Laue Foundry Co. that the stopper accomplishes all that is claimed for it. It will be noted that the stopper shown in Fig. 1 is provided with slots in the lip; this is intended to facilitate the use thereof around flask pins, should a runout take place at this point of the flask.

The United Engineering & Foundry Co.'s System of Shop Records.

The shop system of the United Engineering & Foundry Co., of Pittsburg, is not asserted by those who have developed the plan and have it in charge, to be superior to other methods in use elsewhere. In point of fact the method is regarded as being rather the rough and ready expedient that is thrust into action long before ripened development of details has rounded out the arrangement to suit best the peculiar requirements of the plant. The system, indeed, like many others of a similar character, has been produced under that stress of needful shop service which denies delays incidental to the full fruitage of the scheme, and these conditions are adverse to any other than an approximation to the necessities of the case. Installed under such circumstances, a system carries along by sheer momentum a number of surplus items which are gradually discarded when those in charge have a convenient season to cut them loose—and convenient seasons to

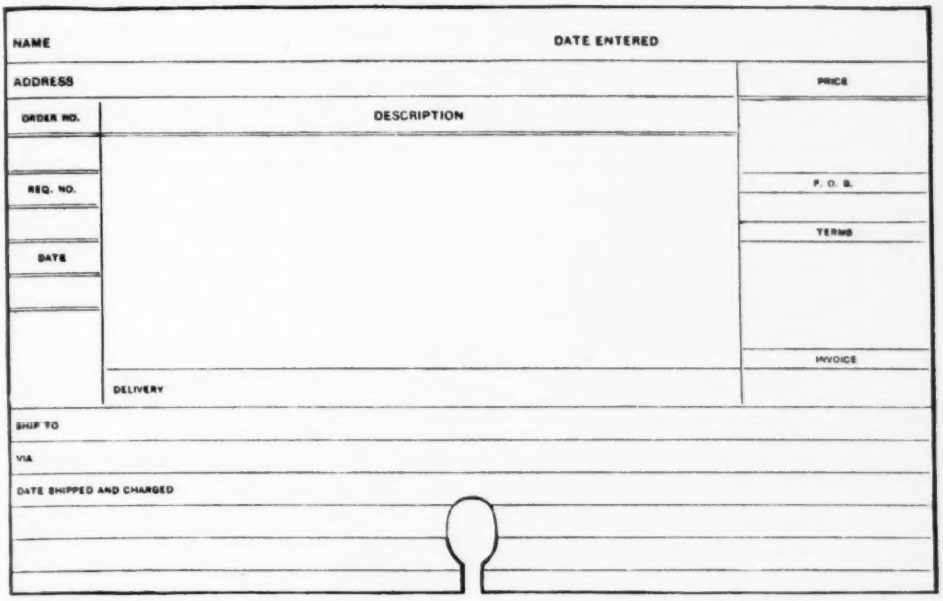


FIG. 1. SHOP ORDER CARD.

attend to matters of this kind are few and far between in these busy times.

The system under consideration does not have any excess of these detracting and impeding attachments. Indeed it seems to the writer that there are few, if any, superfluous and time-consuming details to be found either in the method itself or its application to the varied requirements of a modern plant. President Frank, of the United Engineering & Foundry Co., and Mr. Knotts, of the purchasing department of the Frank-Kneeland plant, who comes constantly in touch with the scheme in connection with the shop and office, do not look upon it as a final and perfected arrangement by any means; but it meets their demands fairly

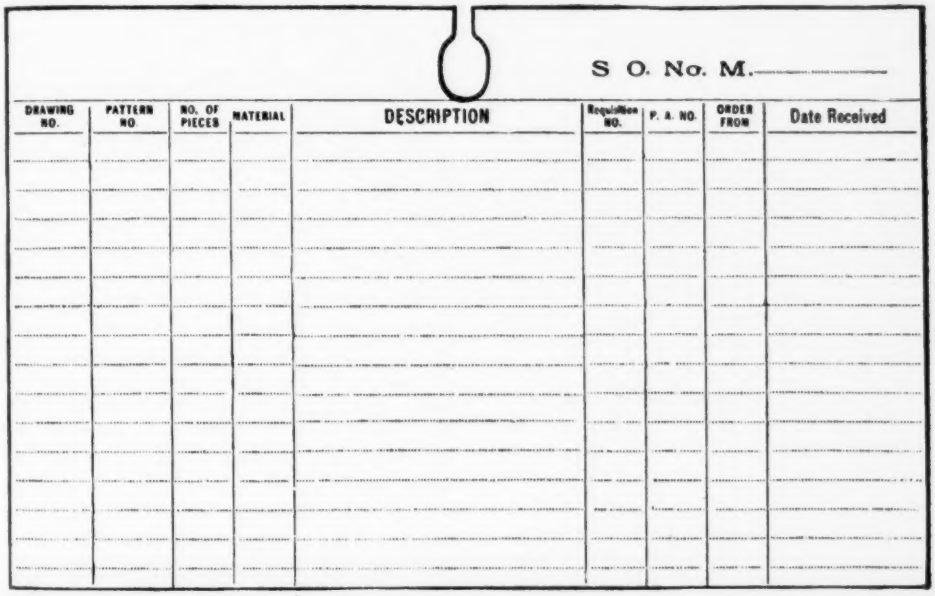


FIG. 2. BACK OF ORDER CARD SHOWN IN FIG. 1.

Order No.----------
Machine No.----------
Name of Machine----------
For----------

PITTSBURG,----------

UNITED ENGINEERING AND FOUNDRY CO.

DRAWING NO.	PATTERN NO.	NO. PCS.	MAT'L	NAME OF PIECE	ACTUAL WEIGHT OF EACH PIECE	WEIGHTS	TOTAL WEIGHTS	RATE	COST	MACHINE WORK	FITTING	CORE MAKING MOULDING	PATTERN WORK LUMBER, FEET	PATTERN WORK LABOR, HOURS

FIG. 3. LIST OF MATERIAL FOR CONTRACTING DEPARTMENT.

well, and on the broad gauge theory that the old maxim regarding familiarity has some weight it is easy to understand how the merit of the present plan may escape appreciation in the field of its particular development.

Mr. Frank says: "It serves our needs quite well, but I have never felt that it was on a scientific basis. Certainly it is anything but the ideal that one could hope for in an accurate cost-keeping system. So far as that goes I fail to see how absolute accuracy is to be obtained unless at a cost for clerical labor that would be out of the question. For instance, there are a number of items in estimating work which vary independently of each other. The time taken by a molder in getting out a piece of work is not always an indication of the weight of the completed casting. His work may increase with the weight or it may run the other way. So with coremakers, laborers and so forth. We take these latter items and charge them up pro rata against the shop product, but do our best to keep track of the weight and labor of direct molding."

The office orders were originally received and entered in a stub book and several carbon copies taken which were torn out for distribution to the different departments. The book was a nuisance because of the difficulty in making rapid reference (any other sort of a reference was out of the question) and the old order system has been cast aside in favor of the card index. The new card is illustrated in Figs. 1 and 2, which show the two sides of a piece of thin but strong cardboard having dimensions of 5x8 inches. Fig. 1 covers the order fully in regard to name and address, price and terms of payment, shipment, the desired and the actual (not always identical, of course) date of delivery, etc. On the back of the same card, Fig. 2, we find the shop order number together with a record of the requisition dates, drawings, patterns, pieces and material required for the work.

The order card, Fig. 1, is the starting point whence some nine lists of material are prepared. These are identical in heading with the one shown in Fig. 3; in fact they agree in the items specified to the following extent: Order No., Machine No., Name of Machine, For, Drawing No., Pattern No., No. Pieces, Material and Name of Piece. This enables the several copies to be gotten out speedily and a copy of Fig. 3 is promptly available for the mill office and the contracting department. The sheet, of which a portion is shown in Fig. 3, is 12x14 inches. On the back of Fig. 3 is

CUPOLA No. ..... Date, ... Foreman.

CHARGE No. 1.	COKE.	CHARGE No. 4.	COKE.
No. 1 Iron,		No. 1 Iron,	
No. 2 "		No. 2 "	
No. 3 "		No. 3 "	
No. 4 "		No. 4 "	
No.		No.	
No.		No.	
Foundry Scrap,		Foundry Scrap,	
Stock Scrap,		Stock Scrap,	
CHARGE No. 2.	**COKE.**	**CHARGE No. 5.**	**COKE.**
No. 1 Iron,		No. 1 Iron,	
No. 2 "		No. 2 "	
No. 3 "		No. 3 "	
No. 4 "		No. 4 "	
No.		No.	
No.		No.	
Foundry Scrap,		Foundry Scrap,	
Stock Scrap,		Stock Scrap,	
CHARGE No. 3.	**COKE.**	**CHARGE No. 6.**	**COKE.**
No. 1 Iron,		No. 1 Iron,	
No. 2 "		No. 2 "	
No. 3 "		No. 3 "	
No. 4 "		No. 4 "	
No.		No.	
No.		No.	
Foundry Scrap,		Foundry Scrap,	
Stock Scrap,		Stock Scrap,	

FIG. 4. RECORD OF HEATS TO BE FILLED OUT BY FOUNDRY FOREMAN.

printed another form which occupies about one-eighth of the available space, thus permitting the large sheets to be folded uniformly and having the endorsement appear in plain sight when so reduced. The form on back of Fig. 3 is a summary of the contents as entered on the face of the document and in general form it is arranged as follows:

Order No.....
Machine .....
.....
For .....
Designed by .....
Built at .....
Drawing Nos. .....
.....
.....
Contract Price .....
F. O. B.....
Delivery .....Date .....

The sheets prepared at the same time as Fig. 3 are, as indicated above, of corresponding style to that sheet and need not be illustrated by separate engravings. One copy is made out for the mill office, a couple are sent to the foundry and one to the engineering office. These sheets have five columns on the right of the page. Four of the columns are headed Molding, Weight, Total Weight, Price, and one column is left blank. These take the place of the columns shown in Fig. 3 and the sheet on that account is correspondingly narrower. The list sheets which are sent to the machine shop, pattern shop and purchasing department, are practically the same as the others with the exception of the columns to the right, which are headed respectively: Order Form, Order No., Date, Received and Remarks.

The United Engineering & Foundry Co. comprises several shops, of which any two or more may combine in the production of a piece of work. The intercourse in a business way between the separate units of the organization is handled precisely as if they were independent of each other, and the system of requisitions for material in filling orders as set forth by the shop lists is therefore a matter for detailed and exact treatment and record. This will explain the thorough-going character of the lists of material and the accompanying data. The parts of the different forms which are similar and contain the same information are filled out at the one time and the remaining columns are cared for in the various departments as the

DAILY REPORT,.....190.....

Order No.	Pattern No.	No. of Piece	Moulder No.	Hours	NAME OF PIECE	Weight
					TOTAL CLEAN WEIGHT.	
					Add for Gates, Heads and Feed,	
					" *Loss in Melt,*	
					" *Feed Iron for Rolls,*	
					TOTAL AMOUNT TO MELT.	
					Total Weight Good Castings,	
					" " *Bad* "	
					" " *of Heads, Gates,*	
					" " *Roll Feed Iron,*	
					" " *of Surplus,*	

FIG. 5. DAILY REPORT FROM THE FOUNDRY.

requisitions are honored and the supplies reach the shop, are weighed, worked up and the labor cost, etc., ascertained in detail.

When the list of material reaches the foundry, the foreman compares the list as early as possible with the patterns and pattern cards which are supplied or accounted for by he pattern deparment. The pattern cards accompany the patterns through the shops and foundry, and from them the clerks derive most of the data for keeping track of the work while in process of molding, etc. The foundry foreman can then proceed to make up his list of heats, etc., as illustrated in Fig. 4. This form is 7¼x8½ inches and a separate sheet is reserved for each cupola or furnace. It may be pointed out that the terms No. 1 Iron, No. 2 Iron, etc., do not necessarily refer to the grade of material, but in this case are employed to designate the different piles of the stored pig iron. The iron when received by the clerk is placed according to convenience of handling and the

RECAPITULATION.

Cupola Charge		Weight Charged	
No. 1 Iron		Weight of Good Castings	
" 2 "		" " Bad "	
" 3 "		" " Surplus	
Stock Scrap		" " Heavy Gates	
From Furnace		Lost in Melt	
Total Weight Charged			
Total Amount Coke			
Furnace Charge			
No. 1 Iron		Weight of Good Castings	
" 2 "		" " Heads	
" 3 "		" " Surplus	
Foundry Scrap		To Cupola	
Stock			

FIG. 6. PRODUCT OF AND CONSUMPTION BY CUPOLAS AND FURNACES.

United Engineering & Foundry Co.
Frank-Kneeland Machine Co. Dept. *190*

FOLLOWING CASTINGS DELIVERED TO
MACHINE SHOP.

MACHINE SHOP RECEIVING CLERK will O. K. this slip and send it to mill office immediately after checking each item off in shop order book. He will also see that castings are plainly marked and report any errors to foundry clerk before truck is unloaded.

Foundry clerk will deliver one copy direct to mill office.

Order No.	Pattern.	No. Pcs.	NAME	Weight

FIG. 7. DELIVERY SLIP USED BY SHIPPING DEPARTMENT OF FOUNDRY.

series of pig iron piles have thus a purely conventional arrangement which is peculiar to the layout of the plant.

The daily report of the foundry is illustrated in Fig. 5, which in the original sheet is 7x12 inches. This form covers the list of pieces made with the number of hours expended on molding. The weights, as indicated by the column on the right, cannot be entered until a later date and in practice this column is not used as the material list sent by the foundry in the first place provides an opportunity for covering all requirements. The lower portion of the form is filled out for the use of the office force who check up the work of each molder in a journal. This journal has the two facing pages assigned to each day's work in the foundry and the whole of the left hand page and the greater part of the right hand page are given up to a repetition of the form shown on the upper part of Fig. 5. The lower part of the right hand page of the book is ruled off, as in Fig. 6. This is practically a ledger account with the cupolas and furnaces and the method of balancing the respective debits and credits is a constant check upon the work of the foundry. The amount of material used in the foundry is thus kept in account with the diminishing stock on hand and the quantity is replenished from time to time as the drain of daily requirement reduces the supply from the prescribed minimum.

The castings as they are taken from the sand, brushed, pickled and snagged, are checked, weighed and delivered to the machine shop with the slip shown in Fig. 7. This is a 5⅜x 7¾-inch sheet taken from a stub book and made out in duplicate. The original goes to the machine shop, whilst the copy is sent direct to the mill office. The stub remaining in the book retains a copy for the use of the foundry.—*The Iron Trade Review.*

The J. George Leyner Engineering Works Co. has been incorporated at Denver, Colo., with a capital of $650,000 and will build a large manufacturing plant in the vicinity of Denver. Plans have been prepared for a foundry 100x 144 feet, pattern shop 50x164 and the necessary machine and blacksmith shops of ample proportion. The concern will make air compressors, rock drills and several specialties in mining machinery.

The C. A. Treat Mfg. Co., of Hannibal, Mo., will extend its car wheel foundry by an addition 90x100 feet.

Comparison of Test Bars.

BY ASA W. WHITNEY.

In continuation of my article in THE FOUNDRY of September, 1902, it occurred to me that the following table which I worked out some years ago for my own purposes would be valuable to many founders and further illustrate the convenience of comparing strength by Modulus of Rupture, even in the case of such material as cast iron, whose qualities are so greatly modified by rates of cooling.

As yet there has been no mathematical method worked out by which the factor for the strength of a given section can be properly corrected for its rate of cooling. In certain sorts of compositions and within limits as to shape and size the correction would be small and experience at present enables founders to know about how much allowance from the assumed homogeneity must be made. Knowing the composition of the calculated charge of metal chemically however, enables one to estimate approximately the possible structural compositions of the castings in terms of ferrite, perlite, cementite, graphite, iron-phos-

Shape and Position of Cross Section of Test Bar for Transverse Test. Length of Side. b=breadth. d=depth.	Area of Cross Section.	Length of Bar Between Supports.	Mass or Cubic Contents Between Supports (Cubic inches).	P, or $\frac{\text{Perimeter of Cross Area}}{\text{Section (Ratio of Mass to Cooling Surface)}}$.	I, or Moment of Inertia of the Cross Section.	Factor for the Modulus of Rupture (Multiply by Stress).	Stress, or Center Breaking Load Equivalent to a Modulus of Rupture of 50,000 lbs., or 30,000, Factor	Deflection at Center Equivalent to a Modulus of Elasticity of 10,000,000 Lbs.	Rates of Contraction, if 1" Bar Contracts ⅛" per Ft., or 1.0416% of Length of Pattern. Inch per Foot.	Per cent of Molded Length
½"	¼"	12"	3."	8	.005209"	144.	347.25	.2400"	.13095"	1.0913
1"	1"	12"	12."	4	.08333"	18.	2778.	.2700"	.125"	1.0416
1"	1"	18"	18"	4	.08333"	27.	1852.	.2700"	.125"	1.0416
1.22475"	1½"	12"	18"	3.2666	.1875"	9.7975	5102.	.09795"	.12283"	1.0237
1.73205"	3"	12"	36"	2.3095	.750"	3.464	14436.	.06928"	.11722"	.9770
2"	4"	12"	48"	2	1.333"	2.25	22220.	.06002"	.11457"	.9548
b=2.666" d=1.500"	4"	12"	48"	2.0833	.750"	3.00	16666.	.0800"	.11537"	.9615
b=1.500" d=2.666"	4"	12"	48"	2.0833	2.333"	1.6875	29631.	.04574"	.11537"	.9615
b=1.2" d=2.5"	3"	12"	36"	2.4666	1.875"	2.40	20835.	.0400"	.11832"	.9861
b=2.5" d=1.2"	3"	12"	36"	2.4666	.360"	5.00	10000.	.1000"	.11832"	.9861
b=1." d=2."	2"	24"	48"	3.000	.16667"	18.	2778.	.4800"	.12133"	1.0110
b=2." d=1."	2"	24"	48"	3.000	.66667"	9.	5556.	.2400"	.12133"	1.0110
b=2.00" d= .75"	1½"	15"	22.5"	3.666	.070315"	20.	2500.	.2500"	.12400"	1.0333
b=1.00" d= .50"	½"	16.66"	8.33"	6.000	.010418"	100.	500.	.46285"	.1289"	1.0742
b= .50" d=1.00"	½"	16.66"	8.33"	6.000	.041666"	50.	1000.	.16875"	.1289"	1.0742
Diameter 1.382"	1½"	20.73"	31.095"	2.8947	.17905"	20.	2500.	.25915"	.12082"	1.0069
Diameter 1.1284"	1"	12."	12."	3.545	.07959"	21.287	2349.	.10627"	.12460"	1.0384
Diameter =1.1284"	1"	11.275"	11.275"	3.545	.07959"	20.	2500.	.0938"	.12460"	1.0384
Diameter =1.9544"	3"	14.660"	43.98"	2.0467	.7162"	5.	10000.	.09173"	.11504"	.9588
Diameter =1.9544"	3"	12."	36"	2.0467	.7162"	4.093	12217.	.06142"	.11504"	.9588
Hexagon Side =1.0745"	3"	12."	36"	2.149	.720"	3.8645	12939.	.06497"	.11595"	.9664
Side =1.2408"	4"	12"	48"	1.861	1.280"	2.51	19920.	.05602"	.11319"	.9432
Side = .8773"	2"	16.91"	33.82"	2.6319	.320"	10.	5000.	.1574"	.11938"	.9945
Side = .75983"	1½"	21.96"	32.94"	4.5590	.180"	20.	2500	.3065"	.12155"	1.0130

phide, etc.; and by the present practical developments of metallography (the study of microstructure of metals), the structures which actually result are accurately observed and mapped out. From this study we may eventually expect further developments in the line of very accurate estimations of strength from the calculated melting charge (or more closely still from any analyzed piece), for the structure which will result in any given section. In the field of steel the use of metallography has been long conceded, as steel chemists were the more indispensable and were the first to learn the necessary limitations of their ultimate analyses and to recognize the structures developed in steel or cast iron.

Although in this table it is merely assumed that all of these bars are cast from the same iron, without correction for the lack of homogeneity which would result, yet I have calculated what the rates of contraction from the molded length would be, assuming the 1 inch square bar to contract at the rate of 1-8 inch per foot which is 1-96th or 1.0416 per cent. For this purpose it is necessary to use the quotient found under the column $\frac{P}{A}$, etc. This figure is then substituted for R in Mr. Francis Schumann's formula,* Contraction $= \frac{1}{87.2727 + \frac{34.999}{R}}$. The deflection at center under the breaking load for each bar results from the engineering formula based upon the conception of a Modulus of Elasticity which is here taken at the normal value of 10,000,000 pounds. I or Moment of Inertia is used in this formula as well as in the formula for Modulus of Rupture given in my last paper. The formula is $\frac{1}{48} \frac{W. L^3}{E. I.} =$ Deflection at center of bar. Here W = breaking load, L^3 = cube of the length of bar, E = Modulus of Elasticity (10,000,000 pounds) and I = Moment of Inertia.

As an illustration of the maximum difference likely to be found in the same bar tested in different directions I will instance my study† on flat white iron bars, made white by chilling from the flat sides only, but chilled totally to center. A 4-inch area rectangular bar broken flatwise by a stress of 16,666 pounds would, *if homogeneous,* require 29,631 pounds to break it edgewise. But if chilled as stated above it could easily stand the same (16,666 or somewhat more) flatwise, but edgewise not over 16,000 pounds, as it must then break in detail because of the direction of the laminated hard structure in relation to the stress. This direction is very apparent to the eye. In the same way many of the anomalies of cast iron become clear upon inspection with the microscope and in the light of the principles of metallography.

*Contraction and Deformation of Iron Castings in Cooling from the liquid to the solid state. Francis Schumann, Dec., 1896, Am. Society of Mech. Engineers' Transactions.

†Transverse Strength of Chilled Car Wheel Iron. Asa W. Whitney, Journal of the Franklin Institute, April, 1897.

Cost Keeping in Foundries.

I notice in the October issue of THE FOUNDRY that Benjamin Thompson condemns the system of cost keeping illustrated by me in the September issue as impracticable. As he seems to have failed to understand this system, I will endeavor to enlighten him as best I can. Taking up the points as they appear in Mr. Thompson's article, he believes that it is practically impossible to obtain the exact cost of small castings made in a jobbing foundry, although he does not state the reasons why such should be the case. Instead, he favors the idea of dividing castings into different sections according to their general character, thinking that it would be more convenient for the foundryman to ascertain the cost of producing each class instead of attempting to find the cost of each individual casting. It is my opinion that the cost of each individual casting can be readily located. Let a molder make as many small castings in a day as he pleases and when the time-keeper calls for the molder's time I can see nothing to hinder him from giving the number of hours he has spent on each pattern, or the time which has been spent on each, according to his best judgment, which is the only way that a molder can account for what he has accomplished during the day, and is equal to any time slip the molder might fill out himself. After the exact time on each pattern has been obtained, the accurate labor cost for molding can be had on each casting by dividing the total cost by the number of castings made. The same system can be followed in ascertaining the cost for cleaning and core making, and when one knows what is the actual cost per pound for melted iron and all the other expenses incidentally to operate in the foundry, I know that it is easy to get at the accurate cost of each casting, weighing as low as one half a pound apiece, as it is with castings weighing 20 tons.

In regard to the cost of melted iron I would

say that at the time the article was written, pig iron was worth from $18 to $20 per ton, scrap iron, $13, and coke and coal was much lower than it is at the present time. The cost of our melted iron at that time came within the one cent limit and in addition I would also say that this item does not include any of the expenses connected with operating the cupolas, as in the system we follow, this is taken care of under the head of non producers and general expenses. It is, of course, granted that it costs the same to melt iron for light castings as it does for the heavier class of work. Referring to the criticism as to the relative cost of molding as compared to other expenses I believe that every foundryman knows that on the class of castings mentioned, molding, core making and cleaning castings are by far the smallest items in their cost. In my former article I gave the actual average cost per pound and notice that Mr. Thompson puts considerable emphasis on the fact that labor only amounts to 16 per cent against 32 per cent for expenses. I will explain that the cost of a casting must be figured this way in order to insure no loss to the foundryman and yet not overcharge the customer. Taking a casting, such as is described in the original article, and it requires exactly five days from the time the job is started until the casting is in the cleaning room. This casting must stand its share of all expenses according to its weight and cost of labor to produce. The expenses of a foundry are very high each day, and include rent, taxes, insurance, light, heat, power and wear and tear on everything inside the foundry, together with expenses for repairs and salaries for such non producers as manager, superintendent, foreman, and other persons, who draw pay in one position or another. Then the material in the foundry is not to be found on the dump, but must be bought and paid for, which causes the foundryman to charge for this on his cost card for each casting.

I believe every foundryman is familiar with the supplies required in the foundry and by careful figuring for years of all these different items, we find that the system explained in my former article is the only one which will give us the average cost for any class of castings made.

I do not understand why Mr. Thompson objects to the system of charging the rejected casting at the price at which it would have been sold, as I believe this system is very just. If the casting had been good and had been delivered the foundryman would certainly have received the full price, which would be greater than the actual cost to produce it. All we have left is scrap iron which is to be broken up again and go through more handling than if the casting had been a good one. Taking account of everything, one half cent per pound is about all one would expect as credit, and this we get in the yard report, as all foundry scrap is charged into the cupola without taking account of it the second time. Its value may, if it is so desired, be fixed at an arbitrary figure as it belongs to the shop and is home made scrap. Now on the other hand, if the casting had been good and delivered to the customer the foundryman would have received for this casting at least one cent per pound more than the actual cost charged to the foreman, which in this case would make a loss of $90.00 to the foundryman and no loss to any one else.

In regard to the melting ratio quoted, if Mr. Thompson will figure up the whole heat he will find that this is only 1 to 10.4, which, I believe, any foundryman could easily attain. Mr. Thompson also overlooks the fact that in addition to the semi-annual report shown, we also have weekly reports giving the cost of producing castings in complete form, as does also the monthly report shown in connection with the system. In this way we are able to get at the cost of each casting made, as we have the individual cost cards and from these the reports are made, which makes the system as accurate as it is possible to have one in any foundry. I still believe that the system I am working under is as good as any used in this country for foundry purposes. My idea in preparing an article on this subject was not to show any one what I could do in the way of producing castings or melting iron, but rather to give foundrymen a chance to become acquainted with the system under which I am working.

S. F.

Cost of Production.

Many methods have been tried of arriving at the cost of producing castings, both in regard to the cost of individual castings and in certain quantities. A plan known as the "Percentage System" is followed by a large foundry with which the writer is familiar. Here all the molders and apprentices, as well as core makers, have time books, in which the time spent on any particular job is recorded, a sep-

arate distinction being made for overtime. The laborers, casting cleaners, furnace men and cupola tenders record the number of hours they work each day and the particular department in which their time is spent. All of these time books are checked over each morning by the foreman of each department.

This method of arriving at the cost of castings is very simple and as far as the employer is concerned very safe, but in many instances it creates situations which are rather awkward for the foreman. For example, if the wages of the molders, core makers, and apprentices should total £21-0-0 per day and the amount paid out for furnace men, cupola tenders, casting cleaners, laborers and general shop supervision should amount to £7, the relation of the latter item to the former is about one to three, so that if the molding and core makers' time on a casting amounts to £1, six shillings and eight pence is allowed as a shop cost to cover other items. It being presumed therefore that in this particular instance the cost of producing these castings would be £1-6-8.

With careful supervision and a good practical knowledge carefully applied, the above method of obtaining a general estimate of shop costs is a very good one. But unless great care is exercised in recording and checking the time in the foundry as well as in the timekeeper's office, endless complications and awkward contradictions will be constantly occurring. Particularly so if the system is being used in a jobbing shop where the molders are shifted around on different classes of castings daily, and where it is the exception rather than the rule to have a job of any kind extend over a lengthy period.

In order to illustrate the apparent inconsistencies in the cost of similar castings, as they appear to the office staff, I will cite a few instances. Let us say that there are 12 columns to make, of which the molder will cast one a day. The molder's wages will be, say, 12 shillings, and the amount to be added for general expenses will be 4 shillings, making a total of 16 shillings. Let us suppose that this column will weigh about 13 cwt. and that a short time afterward the same molder will be given a similar column, but having only about half of the thickness of metal of the former. In this case the molder will use the same flask as on previous occasions and will take as long to mold it as he did the last one. The cost will therefore be the same, but as the weight is only about one-half of the former casting the cost per cwt. is very nearly double. The office will naturally want to know the reason why one lot of columns should cost almost twice as much as another. Examples of this kind might be continued, but sufficient has been said to show that considerable confusion may be caused to one not in possession of all the details connected with the job.

Let us use another illustration. There are two castings to be made of one pattern, one of which must be cast in a hurry while the other one will be acceptable later on. There is really a day and a half's work in the job but you think that with a bit of push you will manage it alright, so you put your best molder on the job and send a laborer with him telling him that you must have the casting that day. The men work hard and the casting is finished satisfactory at a cost for molders' wages of 12 shillings, to which is added the general item of shop expense of 4 shillings, making 16 shillings. The laborer does not put his time down on the job and some time later, when the molder is required to make a second casting he takes half a day longer to complete the job, as he has not the assistance of a helper, the result being that the job is credited with the molders wages of 18 shillings, plus a shop expense of 6 shillings, a total of 24 shillings, as against 16, for the former casting. The office cannot understand what appears to them to be extraordinary inconsistencies and in a general way the foreman is blamed for carelessness in checking the time.

The illustrations I have given are not imaginary, but have occurred in actual practice and I have no doubt all general jobbing shops similarly situated might experience the same trouble. The foreman will blame the system of arriving at the cost of production and the office will blame the department or the foreman of same. In spite of all of this I am convinced that the percentage system as explained above is an extremely good one and will give one a very fair idea of the cost of production. It is not the system which causes these inconsistencies in the cost of apparently similar castings, but rather the method of applying the system.

If more confidence existed between the office and the foundry foreman, there would not be so many complaints from managers as to the difficulty of arriving at an accurate estimate of the cost of producing castings. Before an estimate is made out for any contract the foreman should be consulted, not necessarily as to what it would cost to produce the work, but he

should certainly be allowed to see the drawings. He should be questioned as to his ability to produce the required castings at the same price as the last order, if he has suitable flasks for this job, or if it will be necessary to make new ones. These and other questions should be put to the foundry foreman, and if he has a good practical knowledge of his business he will answer them to the advantage of his employer. If his answers are not borne out by results he is evidently not suitable for the position he occupies. I am quite convinced after considerable experiments and a great amount of careful thought that there is no system of arriving at the correct cost of producing castings in general jobbing work, unless the foundry foreman is consulted on the points I have enumerated above, when I am quite sure those in the office would find the many inconsistencies they now have to contend with in estimating the cost of production would disappear, and they could depend upon getting the same casting at the same price every time it was ordered. HARRY WILLIS.

Manufacture of Pig Iron.*

The term iron, as used in a general sense, includes all those products obtained originally from iron ore by smelting with fuel. Under the general term iron we have pig iron, which is iron made from ores in a blast furnace and cast in the form of pigs. The fuel used may be coke, charcoal, anthracite coal, or mixtures of these, and the pig iron is named according to the fuel used in smelting, as coke pig, charcoal pig, or anthracite pig. Then, under each of these, are other classifications according to the purpose the pig is applied to, viz.: basic, Bessemer, malleable, mill and foundry.

Basic pig iron is iron intended for conversion into steel in a basic open-hearth furnace. To be suitable for this work the silicon and sulphur must be low—the former less than one per cent, and the latter not over five one-hundredths of one per cent. Bessemer iron has its use in a Bessemer converter where the silicon and carbon are burnt out by blowing air through the molten metal. As it is impossible in the Bessemer converter to remove the phosphorus and sulphur, there must be a low percentage in the pig iron, as in the requirements for finished steel the phosphorus must be below one-tenth per cent, and the sulphur below five one-hundredths. Malleable pig is remelted into castings which are afterwards put in annealing ovens where the carbon, silicon and manganese are gradually removed by oxidation. Since the object is to get a casting with as little impurity as possible it is desirable to have pig iron to begin with which is low in the impurities; hence, malleable pig should have low carbon, low silicon and low manganese.

Mill iron is used in rolling mills where it is put in puddling furnaces and where all the impurities, such as silicon, carbon, sulphur, etc., are worked out of it, making wrought iron. Sometimes wrought iron is made direct from ore without first making pig iron. This is really the process by which iron was first made. It takes a very high temperature to melt wrought iron, but it may be readily brought to a welding heat in a heating furnace, and then rolled into bars. A peculiarity of wrought iron is its fiber. When broken it presents a fracture like wood. A piece of steel in breaking shows no such fiber, only a clear, uniform break. The wrought iron has slag disseminated all through it and when rolled out these lines of slag break the continuity of the metal and make the fiber.

Foundry iron, chemically speaking, is the most impure of all iron. It has in it a greater percentage of foreign material than any other class of iron. A typical foundry iron, for making soft castings, has only about 93 per cent of its substance iron. The remaining 7 per cent is made up of about 3.50 per cent carbon, 2.50 per cent silicon, .50 per cent manganese, and .50 per cent phosphorus. It is these impurities in cast iron which make it weak by comparison with wrought iron and steel, and account for its lack of ductility, but since the application of chemistry to foundry work a great deal has been done in the way of adjusting the elements which mainly influence the strength and softness of cast iron, so that castings can be made with much better adjustment of the material to the work it is intended for.

All foundry iron was formerly graded by fracture and color. This was done as carefully as possible, but it is a difficult matter to draw the line between a close No. 1 and an open No. 2. No matter how carefully grading by fracture and color is done there is always a considerable personal factor in this work, so that in some cases, a carload which one man would grade No. 1, another man with equal experience would grade as No. 2 at another time.

*A paper read by Charles Fox, superintendent of the Hamilton Steel & Iron Co., before the Canadian Association of Stationary Engineers, Hamilton, Ontario.

And even if at all times the grading by fracture were well done, it is no reliable indication of what the iron contains or the purpose it is best suited for. The grain of iron is determined partly by chemical composition and partly by the condition of the blast furnace at the time it was made. All that can be deducted from the fracture of iron is that open-grained iron is generally low in sulphur and close-grained iron is generally high in sulphur. Careful chemical analysis is the only trustworthy means of finding out what an iron contains, and what class of castings it is best suited for making.

Silicon is the best known of all constituents of pig iron. It increases the fusibility of iron, lessens the formation of blowholes, and reduces the chance of shrinkage. The strongest castings are obtained from iron that will produce sound castings with the least amount of silicon. Pig iron, with excessive silicon, has a characteristic fracture; the grain is often close and flat and the color light. The most important action of silicon in iron is to convert combined or hardening carbon into graphite or softening carbon. Carbon exerts the most vital influences upon the character of pig iron. It affects the color, strength, hardness and fusibility of cast iron. It exists in pig iron in two distinct forms, the combined and the graphite, and upon the relative proportions of each, in a great measure, depends the character of the metal. The tendency of phosphorus is to prevent blowholes and render the metal very limpid, so that it will give an extremely fine and sharp casting. The percentage of phosphorus varies in pig iron from a trace to several per cent. Manganese assists in the prevention of blowholes. It has a great affinity for sulphur. When iron is melted with fuel containing a high percentage of sulphur, the manganese seizes upon the sulphur, and carries it off with the slag. It also strengthens the castings.

Sulphur is without doubt the most deleterious substance found in pig iron. It makes iron red-short, that is, brittle when hot, also hard and white, sluggish and thick, causing blowholes during its solidification. Limestone is generally used for removing sulphur. When iron is melted in a cupola it loses some silicon, carbon and manganese. These elements being oxidized by the air blown into the cupola, it follows, since these softening elements are reduced by smelting iron in a cupola, that castings are harder than the pig iron from which they are made. Each successive smelting removes still more of the softening elements, carbon and silicon. The only element absorbed by iron in the cupola is sulphur, which it takes from the coke. As the affinity of sulphur for iron is greater at low temperature than at high temperature, more sulphur will be taken up when castings are made with iron just above melting heat than if they are made with very hot metal. Coke, for foundry use, should be of the highest grade obtainable, because the impurities in the coke are taken up to a very high extent by the iron in melting. Good coke has a bright lustre and a metallic ring. It should be strong and light, and low in sulphur. The only accurate way to determine the amount of sulphur in coke is to have it analyzed by a reputable chemist.

Coming now to the blast furnace. If we had merely to melt the iron, as in a cupola, the operation would be comparatively simple, it being only necessary to maintain the proper temperature. But in the blast furnace we have to take away oxygen from the iron it is combined with in which combination it is known as ore. After separating the iron from it it has to be melted, and has to be impregnated with carbon and silicon. It is probable that these three reactions take place in some degree, simultaneously. To take oxygen away from iron and silicon heat is not enough; we must have the combined action of white hot carbon and heat of special intensity. This heat is obtained by blowing a strong blast of air into the bottom of the furnace through tuyeres. This air has been previously heated in firebrick stoves to a temperature of about 1,200 degrees F. and when it enters the tuyeres it meets a layer of coke which has already been made white hot, by descending from the top of the furnace through ascending gas. When the highly heated air meets the white hot carbon, rapid combustion takes place, and an extreme high temperature is developed. In a furnace working regularly the temperature is highest at tuyeres and gradually decreases to the throat. It has been proved by chemical and physical laws that this method of working is the most economical of fuel, besides giving a better and more uniform grade of iron.

The Three Rivers Foundry & Machine Co. has been formed at Three Rivers, Mich., with W. W. French as president; L. B. Place, vice president and general manager and Frank B. Watson, secretary.

Storage Vaults of the New Foundry of the Brown & Sharpe Mfg. Co.

A new foundry is being built by the Brown & Sharpe Mfg. Co., of Providence, R. I., and the method adopted of providing space for the storage of foundry supplies and material is somewhat novel. The area covered by cement walls and arches, as shown in the illustration, is 42x290 feet, and the arrangement is such that two levels are available for the heavy work of a modern foundry. There are 24 vaults, each 12 feet wide and 40 feet deep, and provided with three manholes to allow the dumping of sand, etc., from the storage area above. The top of the vaults is 17 feet above the foundry floor, and is on a level with the charging floor of the cupola house and is intended to be used for the storage of pig iron. It will be approached from the right by a roadway of easy grade. These vaults are composed entirely of cement concrete, excepting that the arches are faced with a single course of brick. The new foundry will run parallel with the face of the vaults, leaving a driveway 20 feet wide, which will be bridged at a point opposite the cupola house to provide a convenient way of handling iron, etc., from the storage area to the charging floor.

STORAGE VAULTS CONNECTED WITH THE NEW FOUNDRY OF THE BROWN & SHARPE MFG. CO.

Knowledge of Chemistry a Necessity.

It is essential for the foundry foremen of our modern shops to know the chemical questions relating to the trade. Of course it is but seldom that a competent foundry foreman can find time to attend a college or any other educational institution where the subject of chemistry is taught in full. The past has shown, however, that it is not necessary for the foundryman to become a professional chemist, nor is it necessary for the chemist to master the foundry business. It is possible for these to work in unison and from this the best results must be expected.

Only the largest foundries can afford to support chemical laboratories of their own, but even where no objection can be offered to the expenses thus incurred I would not place a chemist ahead of the foundry foreman. Each has got a mission to perform and there is plenty of work cut out for them without interfering with one another.

Chemistry has done much in the past twenty years in advancing the interests of the foundry business. It has taught us the physical properties of cast iron and the effects of its different constituents in such a form that we may without a great sacrifice of time obtain a mixture which is suitable for any class of castings. I have reason to believe that a good many manufacturers of pig iron do not always furnish a correct analysis of their product, but this is a small matter, as the cost of rechecking does not amount to much.

If a foundryman would follow closely the guide which a chemist gives him there would be less trouble in obtaining the best results in the making of castings; however, too often we find that the men in charge of our foundries are machinists, boiler makers, pattern makers and other individuals without any practical knowledge of the foundry business. Then there are relatives whose only qualification for

the position of foreman is a pull with the proprietor or some big stockholder, and taking into consideration all the peculiarities which exist around some foundries, it is no wonder that we hear some of them asking what they should do with an analysis after it is given them by the chemist. P. BURKE.

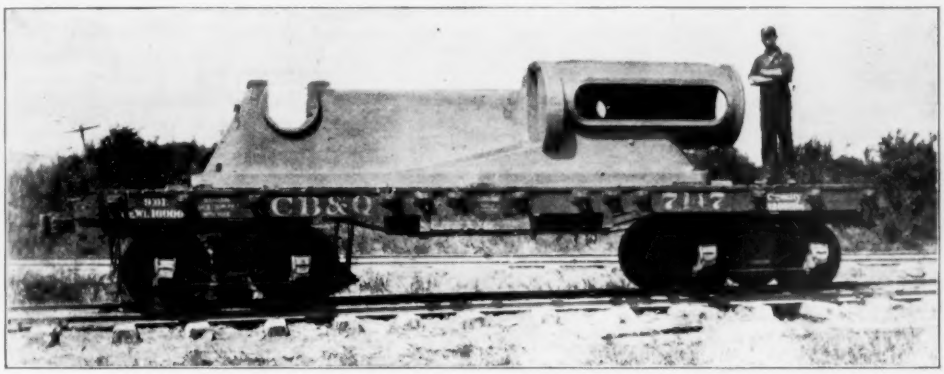
Shop Photography.

The photographic department of a modern manufacturing plant is considered at present almost as essential and important an adjunct to the successful operation of a concern as the drafting room or tool room. It should, therefore, be fully equipped with all the accessories of a first class photographic studio, and when the business is such as will warrant the outlay, a professional operator should be put in charge. The great majority of manufacturing establishments, however, do not care to increase the scope of this department beyond a simple record of standard machines built at the present time, for the purpose of furnishing photographs to intending purchasers, consequently an amateur who may be one of the firm, a draftsman, or one of the workmen in the shop, is selected to do the photographic work which may be required from time to time.

As to the uses of photography, they comprise to begin with, the supplying of photographs of the various products of the establishment, to serve advertising purposes. These photographs are usually made from a point of view that will most readily show the machine as a whole, substantially as it will look to an observer standing at its side, or in front of it. This does not give to an intending purchaser any idea of its construction or the arrangement of the working parts. However, it will in many cases be sufficient, though occasionally a prospective purchaser desires to be further informed regarding other points which are only obscurely shown on this general picture, and in order to enlighten him it may be necessary to make such other views as will explain them.

Photography can be used to advantage also in the pattern room, in making records of patterns, especially in the case of a complicated pattern that would be difficult to understand or to explain to the molder. In the case where patterns are sent to a distance to be cast, photographic records would show just how the separate pieces went together, especially if each piece in the photograph had a number marked on it corresponding to the number on the pattern piece itself. All patterns could be photographed on a small, inexpensive plate, and a print from each pattern could be made a part of the pattern record. If the card index be used for a pattern record, the photograph could be pasted or printed on the back of the record card, and this would show at a glance, even to a novice, the shape and character of the pattern itself, and would aid largely in picking out this particular pattern in the storage room when the occasion required it.

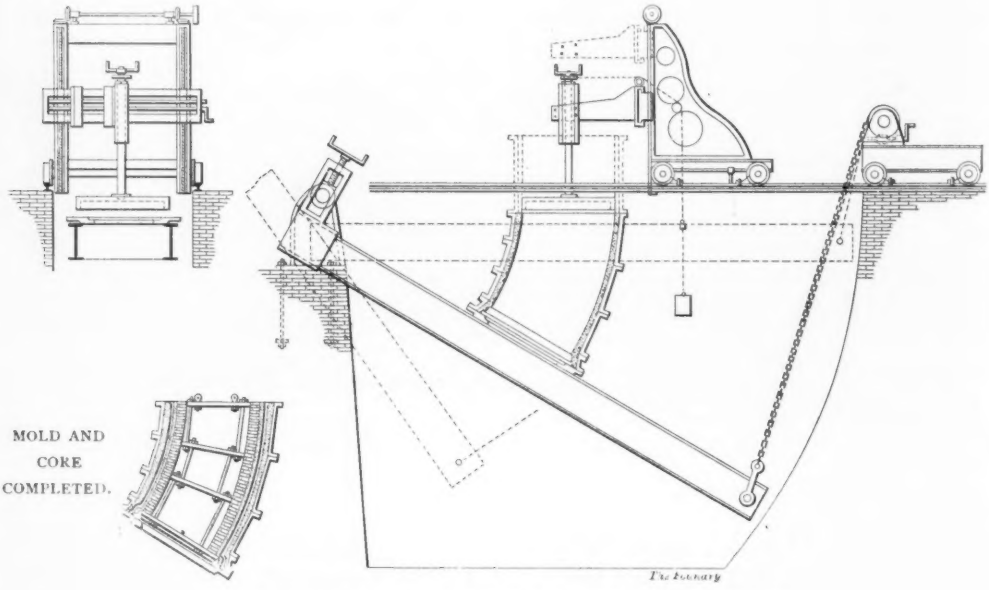
In the foundry, a photograph taken in the process of molding a complicated piece might be of great value for future reference should the same piece be ordered again, and might be the means of saving considerable money in making the piece a second time, especially if a new man had the making of it.—[Albert M. Powell, in *The Journal of the Worcester Polytechnic Institute*.



ENGINE BED FROM THE FOUNDRY OF THE MURRAY IRON WORKS CO., BURLINGTON, IOWA.

The Lambert Molding Machine.

While great progress has been made in appliances for molding and casting water and gas pipes, the special castings used in connection with these have been made as ordinary jobbing castings. A patent has recently been granted the Lambert Curved Pipe Machine Co., of Cincinnati, for a molding machine intended to produce special shapes of pipe castings, particularly those of the larger sizes. Not only is the mold made upon the Lambert machine, but the core for same must also be formed thereon.



THE LAMBERT MOLDING MACHINE FOR SPECIAL PIPE CASTINGS.

Strictly speaking the Lambert machine is not a molding machine, but rather a contrivance which compels the pattern for the casting, and the section of a core box used in making the core, to travel in certain definite directions and gives a mold and core, which in their contour must be true to each other. A casting of very uniform metal should therefore be the result. The general appearance of the Lambert apparatus is shown in the illustration. It is mounted over a pit of sufficient width and length to handle the largest diameter of curved pipe to be made. At one end of this are secured the ends of a pair of I beams which form the support or carrier for the mold and core during preparation.

At the sides of the pit rails are laid forming a track upon which travels the truck carrying the section of pattern to be used in building the mold and core. The small truck at the right in the illustration carries a chain drum, upon which winds the chain attached to the I beam supports, these being raised or lowered as operations may demand. Clamped to the I beams is a bottom plate, adjustable as to the radius desired in the casting. On this is bolted the chill plate or base of the mold, and upon this is centered the flange or socket pattern of the pipe to be cast. When the flask has been placed in the proper position, the section of pipe pattern is lowered upon the socket pattern and ramming proceeds as in ordinary pipe molding. The flasks are made in several sections to facilitate ramming, especially where the castings are long and of short radius. As the ramming proceeds the carrier is gradually lowered, the pattern remaining stationary, thus giving a mold with a uniform curvature. The pattern may also be given a rotary motion which aids in producing a mold with a smooth surface.

The upper or lower end of the casting may be of a straight section, the mold for this being made by leaving the carrier in a stationary position and withdrawing the pattern in a vertical direction through the crosshead mounted on the horizontal arm. When the mold is complete it is removed from the carrier and the core built up in the exact position

occupied by the mold. The rough brick wall of the core is first put up and the loam coating applied afterwards, the shaper for the core giving it its exact size.

When the mold and core have been dried and are ready to be put together, the mold is again centered in the position in which it was rammed up when the core is lowered into the mold, centering itself upon the socket iron on which it was made. By this method of molding it is claimed that a casting of more uniform thickness is obtained than is possible in any other way, also avoiding the use of chaplets and anchors. The Lambert machine is intended to mold special shapes of pipe from 20 inches and upwards in diameter. The lower left hand figure in the illustration shows the appearance of the mold and core when completed, the method of binding the core together being plainly indicated.

Jigs for Molding Machines.*

BY S. H. STUPAKOFF.

There is no doubt that plate molding in its present shape, or rather as ordinarily applied, is practically excluded from jobbing shops. But, if a plate is used in connection with a suitable jig, specially prepared for the purpose, objections are not only overcome, but the application and use of plates offer excellent advantages, even in such cases where only a small number of castings of the same pattern are required at one time. At best, the economic use of plated patterns is limited by the shape and size of the castings. The fundamental principle involved in their construction and application must be fully understood by the user, if satisfactory results are expected.

To begin with, it should be understood that all plates are provided with guide-pin holes, which are accurately fitted to corresponding guide pins forming part of the flasks. Unless special flasks are used in connection with such plates the customary flask pins should not be confounded with these guide pins, as they will never answer the purpose. In order that misconceptions in this respect may be avoided, this term will be adhered to in what follows, and strict distinction will be made between flask-pins and guide-pins wherever they may be mentioned in the course of this work.

The guide-pin holes, G and G^1, Fig. 3, are preferably arranged on opposite ends of the plate, in even multiples of an inch, and equidistant from its center and on a line dividing the plate into two equal rectangles. There are exceptional cases, in which three or four guide-pins must be used. The most serious objection against this arrangement is the greater difficulty experienced in locating the patterns correctly.

Accuracy in preparing the plates becomes of the utmost importance, as the magnitude of all errors occurring in the original laying out is doubled by each subsequent operation. The guide-pin holes should be drilled and reamed out at right angles to the surface of the plate, and it is advisable to provide them with

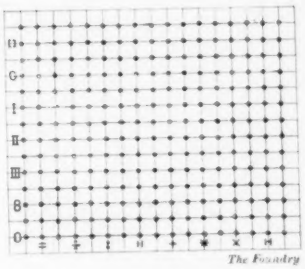


FIG. 1.

FIG. 2.

hardened and ground steel bushings. All guide-pins should be of uniform diameter irrespective of the size of the plate. A pair of test pins should be kept on hand, which snugly fit the guide-pin holes; one-half of one of their ends should have been cut down to about ¼ inch in length, leaving as remainder *exactly* one-half of the cylindrical portion, Fig. 2. If these test pins are inserted into their respective holes and a straight edge be placed against their flattened faces, it will serve for locating the base or the center line of the plate, for marking off and laying out the dowel pin holes, arranging the patterns and checking off all work relating to it.

The exact location of the center of the plate, and likewise the center of the flask, is found by dividing the base line from center to center guide-pin hole into two equal parts. Let us drill a hole O in this place, Fig. 3, and let this hole serve as the starting point for future operations. Now we will assume that we have procured a tri-square with a row of holes drilled in each of its legs; these holes are spaced equally—say 1 inch apart—care being taken that each row stands exactly in a straight line, and that both rows include an

*From a paper prepared for the Boston meeting of the A. F. A.

exact angle of 90 degrees. We place this square in such a manner on our plate that the hole in its apex corresponds with the center hole C of our plate, and insert a good fitting dowel pin through both. Thus we are able to shift the square over the whole surface of the plate by turning it around the center pin. Next we bring one leg of the square over the base line of the plate and insert a second dowel pin (which may be shouldered if necessary) through G into the corresponding hole of our square. Secured in this manner the square should be absolutely rigid and should not shake to right or left on the surface of the plate. We now drill one hole each into the

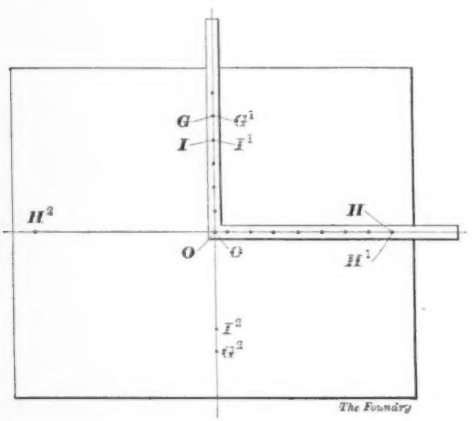


FIG. 3.

plate through the guides H and I of the square, then we remove the pin from G, turn the square around the center pin over 90 degrees, so that one of its legs points upward and the other one to the left, insert a dowel through the hole in the leg pointing upward into the top hole I^1 of the plate, and drill the hole H^2; finally we turn it again over 90 degrees, secure it in the same manner as before, and drill the hole I^2. Figure 3 illustrates the square in the first position as located on the plate; the holes H^2 and I^2 which are drilled subsequently are shown in faint lines. We shall call these holes, in the future, "pilot holes," in order to distinguish them from others in the same plate. These four pilot holes include an exact rectangle or square, and each opposite pair is located at uniform distances from the center of plate and flask. It will be understood that it is not absolutely necessary to employ the square for drilling the pilot holes. For instance, after one plate has been prepared in this manner, this plate can serve as a jig for drilling any number of additional plates in the same manner by a single setting. Such an original or master plate is especially serviceable, if all holes are provided with good steel bushings. The pilot holes in connection with the center hole will serve us hereafter as guides for locating pattern dowels.

Our object in view is to use this plate as a base for any and all suitable patterns, and as an illustration we will arrange it for the reception of patterns of a globe valve and a bib cock. We will assume that the patterns are all in good shape and properly parted. However, they shall originally not have been intended for use with either molding machine or drawplate. Our plate and flask are of a suitable size, but the job is in a hurry—as all jobs are—and we must get out quite a number of these castings today. What are we going to do about it? Take my advice and make it in the old-fashioned way, unless you are provided with a suitable jig plate and an inexpensive but a good small drill press, which was never used by your blacksmiths or yard laborers, but was expressly reserved for this purpose only, was always under the care of a mechanic who understood *how* to handle it, and who took pride in keeping it in good shape.

This jig plate, Fig. 1, should be provided with a number of holes, two rows of which, at least, are drilled exactly in the same manner as those in the above-mentioned square; the balance are laid out preferably, but not necessarily so, in straight and parallel lines, all equi-distant from each other. Its dimensions should be sufficient to cover one corner, or one-fourth of the pattern plate.

If these things are part of your equipment you will have easy sailing, and you will be better fitted to tackle the job than your competitor.

Place this jig in such a manner in one corner of your draw plate that the hole O, Fig. 1, corresponds with the hole C in its center, hold both together with dowel pins inserted into the pilot holes, and drill the holes through the jig into your plate, which are required for securing the patterns in the predetermined places. To avoid mistakes be sure that the hole in that particular corner of the jig, which corresponds to the one described as located in the apex of the square is distinctly marked on both sides of the jig plate—in our figure marked O—and note carefully which holes in

the jig were used for drilling the dowel holes in the pattern plate. Thereafter turn the jig upside down on the pattern plate, insert the dowel pins again through the same holes O and OI into C and I^1, and the third one through OH into H^2, and then, as before, drill through the same guide holes of the jig the corresponding dowel holes into the second quarter of the pattern plate. Repeat the same process at the lower half of the plate, being always careful that C and O remain together and your plate is ready to receive the patterns.

In order to better understand this method of mounting patterns reference is made to illustrations Figs. 4 and 5. The former represents the jig for laying out patterns, the lines thereon showing the position the patterns will occupy when finally mounted on the pattern

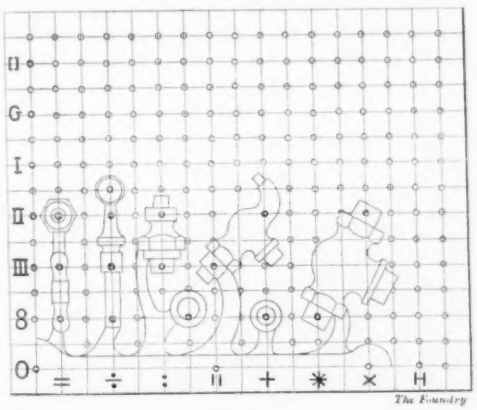


FIG. 4.

plate, Fig. 5. Horizontal and vertical lines, which are provided with identification marks, cross all the holes in the jig plate. The holes which are to be used in this special case as guides for drilling the necessary dowel pin or screw holes in the pattern plate are indicated by heavy circles. Thus, the holes II × and 8* are used for securing the globe valve body pattern, II + and III || for the body of the bib cock, and so forth. By placing Fig. 4 in such a manner over the drawing of the pattern plate Fig. 5 that its hole O corresponds with the center hole C of the latter, and OI and OH respectively with I^1 and H^1, it will be noticed that the outlines representing the patterns cover each other in both cuts. The jig placed in this position over the pattern plate, and secured to it by the pilot pins at O, OI and OH is used in this manner for drilling al dark lined holes in the upper right hand corner of the draw plate. This being done, the pilot pins are withdrawn and the jig plate is reversed and turned into the upper left hand corner of the pattern plate, just as if it were hinged at the line OI, the pilot pins are replaced into the same holes of the jig as before and in this position they will secure it to the pattern plate by entering its pilot holes C, I^1

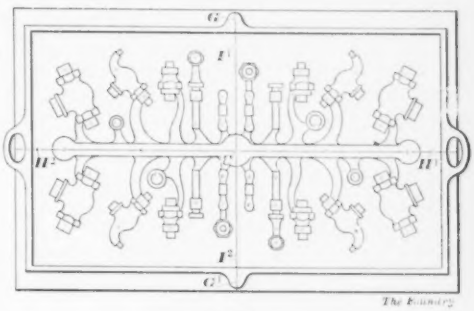


FIG. 5.

and H^2. It will be observed that in this position also, and equally well, the outline of the patterns in both cuts fall exactly together. The jig is used in this position as before, the same guide holes which were used in the first position in the upper right hand corner serve again as guides for drilling the second quarter of the pattern plate. Identically the same process is then repeated at the lower left hand and lower right hand corners of the plate, by first turning the jig plate around the imaginary hinge center OH, and then around OI.

In order to prepare the patterns to suit the above conditions, we proceed exactly in the same manner, by securing one-half of each separately, and always the one which has the dowel holes, at the previously determined place on the jig plate and drilling clear through the holes which coincide with those drilled previously into the pattern plate. The second halves of these patterns are then placed in position against the first (drilled) halves; they are prevented from moving sideways by their original dowel pins, and they may be held together by suitable clamps. These clamps are preferably made of a universal type which adapts them for use with all kinds of patterns, their lower portion being constructed in the shape of a frame which rests on the table of the drill press without rocking and which is adapted for fastening the patterns in such a manner that their parting faces stand parallel to the drill table. The half of the pattern

which has been drilled first with the aid of the jig occupies the upper position in this clamp or drill frame, and the holes in this one will now serve as guides for the drill to drill the holes in the second half which stands directly underneath. Finally have the original dowel pins of the patterns removed and fasten all parts separately in place on the pattern plate by either dowels or screws, or both, whichever may be preferable and most convenient in each particular case.

It will thus be observed that we have prepared the pattern plate in this manner with four complete sets of patterns; yet, we have used only two. The castings resulting from the use of these plates should be perfect as to match. The amount of labor required to withdraw the patterns from the sand is reduced to a minimum, additional time is saved by the use of a stationary gate or runner on the plate, and double the quantity of castings can be produced in this manner with the same number of patterns and in the same number of flasks.

From the above description it will be noticed that it is not necessary to have an individual plate prepared for each set of patterns. Yet I thought it better to describe this method of preparing pattern plates and patterns for plate molding in detail, than to leave room for any doubt or error. It is easily seen that much of the time which it apparently took to get the plate and patterns ready for the molder, can be saved by providing the entire surface of the plate with dowel holes before putting it into use. This should be done with the aid of the jig and in identically the same manner as has been sufficiently explained in the foregoing. Thus, only new patterns have to be prepared for the purpose, and all others, which once have been fitted, are easily replaced and secured to their correct positions on the plate, providing their dowel holes are provided with specific numbers, letters or identification marks. The additional holes in the plate will not impair its working qualities, but they can be easily closed up with beeswax if objectionable. Finally, it is well worthy to note that each plate can be used in connection with all patterns within its range, and that it can be kept in continuous service, while the patterns may be changed at will, and as often as desirable.

At first sight it may appear that the construction and the manipulation of pattern plates has but little connection with molding machines, yet they are not only intimately connected with each other, but they are in fact the principal parts of all molding machines. The lack of intimate knowledge of how to make use of them to the best advantage is generally the reason why a molding machine becomes an elephant on the hands of the molder and an eyesore to its owner.

Fires.

E. F. Parker's foundry at Imlay City, Mich., burned Sept. 18.

The plant of the Rome Stove Works, owned by Bowie & Terhune, at Rome, Ga., was destroyed by fire Sept. 6. The fire started about 7 o'clock in the evening and before it was thoroughly under control extensive damage had been done. The loss is placed at about $45,000 and the insurance at $35,000.

The foundry of the Havana Metal Wheel Co., Havana, Ill., together with the machine shop of the same firm, burned Sept. 21, entailing a loss of $15,000. The plant is to be rebuilt at once.

Skow Bros. foundry at Newton, Iowa, was burned to the ground Sept. 22.

The Chattanooga, Tenn., plant of the American Brake Shoe & Foundry Co. was destroyed by fire Sept. 15, resulting in a loss of $15,000. The works are now being rebuilt on an enlarged scale.

The Tarrant Foundry Co., of Chicago, suffered the loss of its plant through fire Sept. 13. A large number of valuable patterns were destroyed.

The Burton Stove Co., of Cincinnati, suffered considerable loss Sept. 29 through a fire, which started in a small building being occupied as a foundry.

The Wilkes Foundry Co., Toledo, O., which has only been in operation a short time, finds it necessary to enlarge its plant to take care of the volume of business it has on hand. The new addition will be a hundred feet in length. Charles T. Wilkes is general manager.

J. P. Symons & Co., Centralia, Wash., are erecting a large foundry and machine shop at a cost of $35,000. The plant will have a floor space of over 12,000 square feet and will consist of a complete iron foundry, machine shop and supply warehouse, being fitted to do all kinds of repair work and build engines and boilers. It is expected that it will be put in operation by January 1 next.

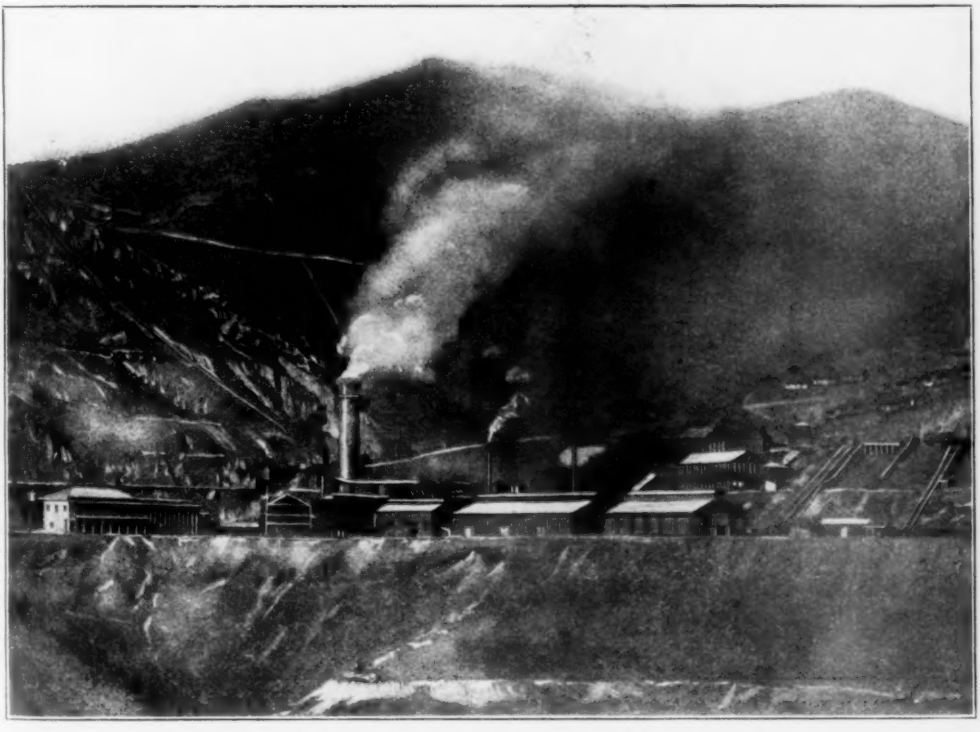
An Out of the Way Foundry.

Down in the southwestern part of the United States, where some of the railroads are contented if they find traffic enough to maintain a three times a week service and where passengers have plenty of time to discuss questions of the day while the train crews are doing switching at side tracks along the road, one will find here and there a place which can boast of a real foundry. Needless to say, such shops are maintained more as a convenience for obtaining necessary repairs on short notice than for turning out castings for new machinery.

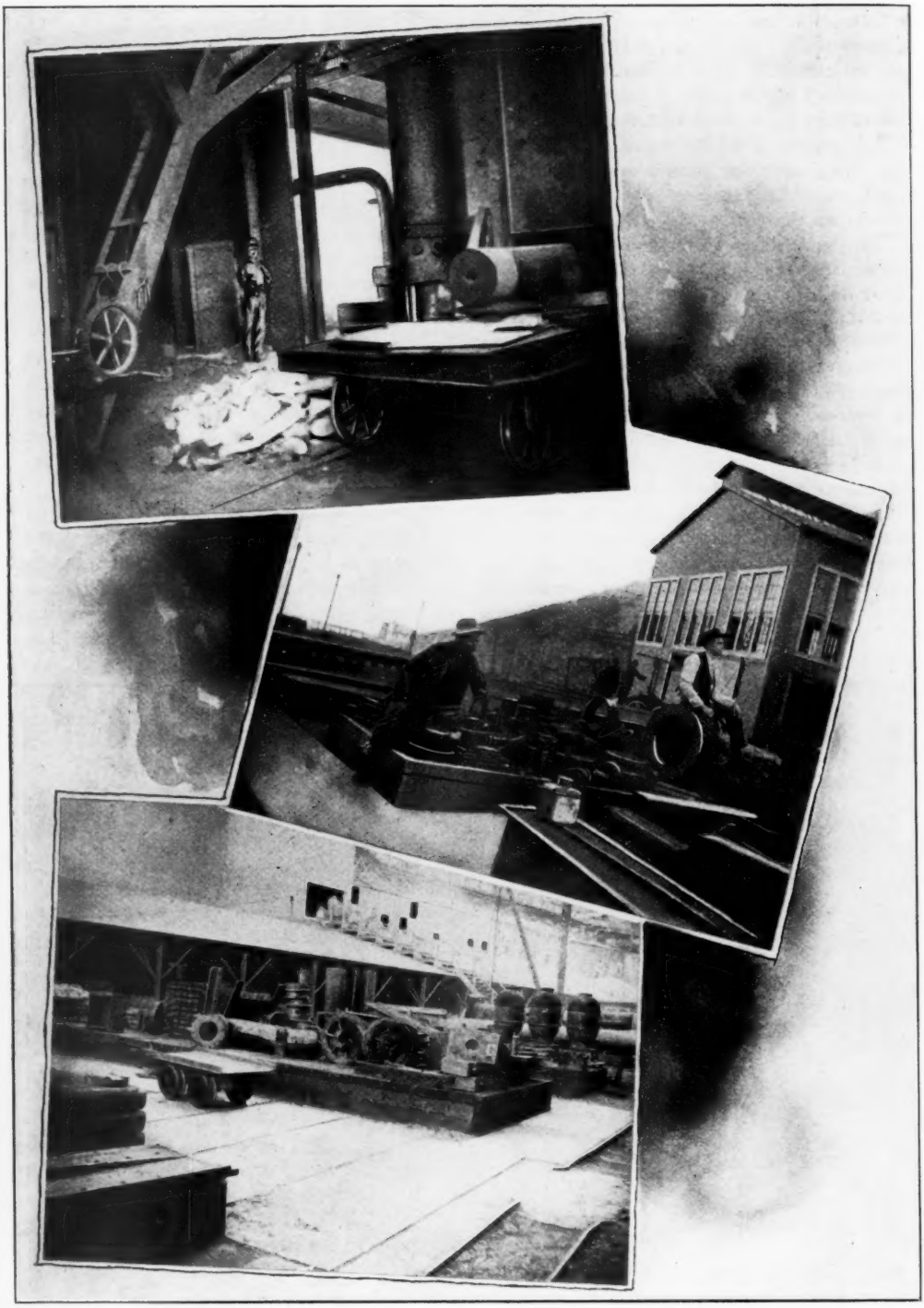
If one leaves the Santa Fe at Ash Fork, Arizona, a couple of hours' journey over the Santa Fe, Prescott & Phoenix will land him at Jerome Junction, where, after more or less tedious waiting, he is permitted to board one of the mixed trains of a road which bears the imposing name of the United Verde & Pacific, although it is barely twenty-six miles in length. The fastest time in which this distance is covered is two hours and after you have several times made up your mind that you can walk faster than the train runs you are finally put down in Jerome, Yavapai County, Arizona, where is located the famous United Verde copper mine, one of the holdings of Clark, the copper king. Nestling at the foot of the Black Hills of Arizona, at an elevation of 5,550 feet above sea level, with the Rio Verde river but a short distance away, there is before us a typical mining town of the Western states.

In the foundry operated by the United Verde Copper Co., at this place one finds the ordinary equipment to be seen at Eastern jobbing shops, but as the heaviest castings turned out do not exceed three tons in weight the powerful hoisting apparatus we are wont to associate with modern shops is not necessary. It should be remembered that both iron and coke are of high value by the time they reach this out of the way place. From four to five tons of iron are melted at a heat and about two thousand pounds of brass castings are required monthly to keep the works agoing.

A novel feature of utilizing wrought iron and steel scrap is in vogue at this plant, where the water as it flows from the mine is strongly saturated with copper, being perfectly green in color. This is made to flow through a flume, provided with numberless pockets, in



WORKS OF THE UNITED VERDE COPPER CO. AT JEROME, ARIZONA.



SOME VIEWS FROM THE FOUNDRY OF THE UNITED VERDE COPPER CO.

which are placed steel or wrought iron scrap which attracts the copper, the granules as they are formed falling into the pockets from whence they are removed and sacked as so much wheat would be and later conveyed to the smelter to be melted. The large stack to which the furnaces are connected is also provided with hoppers to catch the ascending copper dust, when it is carted back to the furnaces to be remelted.

To the newcomer another interesting feature is to see the melted copper placed in the converter, where the sulphur it contains furnishes the initial heat during the blowing process. After being freed from such ingredients as iron, etc., the copper is then either cast into ingots or sent to a tilting furnace, there to undergo a deoxidizing process which further refines it. Being cast into anode molds or ingots the copper is then shipped east to be electrically treated and to have the gold and silver which it contains reduced. Enough of these metals are obtained from the copper found in the United Verde mine to pay all mining, smelting and transportation charges connected therewith. The greater part of the iron melted in the foundry is cast into anode molds, which weigh about 950 pounds each. It requires sixty of these castings for a complete set and two sets are in constant use. Among other equipment the smelter plant of the United Verde Copper Co. also keeps in operation six blast furnaces, seven converters and two tilting furnaces.

Among the Foundries.

The Oscar Barnett Foundry Co., Newark, N. J., manufacturers of malleable and gray iron castings and brass founders' supplies, will erect a new plant 175x200 feet of fire-proof construction and to be equipped with all modern appliances.

The Shirley Radiator & Foundry Co., of Shirley, Ind., have been organized to manufacture gray iron and malleable iron castings and to do a general foundry business. The incorporators are: Robert Martindale, W. W. Knight and Thomas J. Markey. The capital is $50,000.

The Johnson Iron Co. have been incorporated to do business at Gouvernour, N. Y., by John B. Johnson, Harold B. Johnson and Harry D. Hill. The capital stock of the new concern is $30,000.

It is announced on good authority that when the new foundry of the New York Air Brake Co., Watertown, N. Y., is completed, the firm will not only produce their own iron and brass castings but will also supply all malleable and steel castings required in their product.

The plant of the United States Brass & Mfg. Co., Warren, O., has been purchased by E. L. King and C. L. Wood, who will place it in operation. W. I. Jencks, formerly with the L. M. Rumsey Mfg. Co., of St. Louis, Mo., has been engaged as superintendent.

A new foundry has been started at Dillonvale, O., by The Dillonvale Mine Supply & Mfg. Co. L. W. Gilcher is in charge.

An addition is being built to the foundry of Otts Bros., Phœnix, N. Y.

The Breckenridge Foundry, Meriden, Conn., which had been closed for over ten years, has been leased by the M. B. Schenck Co. and reopened. The plant has been equipped with new machinery.

The West Virginia Malleable Iron Co., of Point Pleasant, W. Va., have been incorporated for manufacturing all kinds of iron castings; authorized capital stock, $100,000; incorporators, R. C. Kyle, E. H. Woelffel, J. S. Spencer, Homer Smith and J. M. H. Beal.

A company to be known as the Penn Valve & Fittings Co. is being organized by John Poppinger, Daniel Leffler, J. S. Lowe, Geo. McMichael, O. O. Evans and others to operate a plant at Hunkers, Pa., a few miles from Greensburg. The line of goods to be manufactured will be valves and flange fittings, castings, etc., similar to the output of the Kelly & Jones Co., at Greensburg, where most, if not all, of the leading spirits have been employed for years, some of them as heads of departments. The main building of the new concern will be 270x60 feet in size.

The Lamb Mfg. Co., of Sioux, Nebr., have increased their capital stock from $50,000 to $150,000, and will begin the erection of an addition to its plant to be used for the manufacture of malleable iron castings. At present the plant is manufacturing novelties, and about 40 men are employed. The enlarged plant will give employment to 150 men from the start.

Work on the erection of the new plant of the Fort Wayne Steel Foundry Co., Fort Wayne, Ind., will be begun shortly. The main foundry building will be 60x480 feet and of steel construction. The cost will be about $150,000 and operations will be commenced about April, 1903.

The Illinois Brass Foundry Co., of Chicago, has been incorporated with $10,000 capital by G. F. B. Miller, A. F. Hammann and August C. Waschow.

The Textile-Finishing Machinery Co., of Boston, Mass., has been incorporated with $1,950,000 capital, of which $950,000 is preferred and $1,000,000 common. The new company is a consolidation of the Granger Foundry & Machine Co., the Phœnix Iron Foundry and the Thomas Phillips Co., of Providence, R. I., and the Rusden Machine Co., of Warren, R. I. At a meeting of the incorporators the following officers were elected: President. H. Martin Brown; vice president, Frederick C. Sayles, Jr.; general manager, E. A. Rusden; general sales agent, Frederick I. Dana, and Henry A. Tillinghast, secretary and treasurer.

Butts & Slack, Medina, N. Y., manufacturers of soil pipe and fittings and plumbers' supplies, incorporated as the Medina Foundry Co. some months ago, are erecting a new plant which they expect to have in operation by January. There will be a foundry, 80x150 feet; machine shop, 35x50 feet; rattling room, 25x50 feet; warehouse, 50x100 feet; pattern room, 30x40 feet, and a blacking room, 25x30 feet. The officers are Michael Slack, president; Orren F. Butts, vice president and general manager, and B. Edward Slack, secretary and treasurer.

The Philadelphia Steel & Iron Co., Philadelphia, which recently absorbed the Ferro-Carbon Casting Co., has let the contract for a new 12-ton melting furnace, and contemplates further additions and improvements to its plant in the near future.

The Monarch Foundry & Machine Co., Cincinnati, is being reorganized and will apply for an increase in capital stock to provide for an extension to its plant to double the present capacity. The company is engaged at present on light castings and machine work. The extension will be used for heavy casting work and will include in the equipment a 10-ton traveling crane.

Lazard Kahn, of F. & L. Kahn & Bros., stove manufacturers of Hamilton, O., has been appointed receiver of the J. C. Bartlett Co., stove and range manufacturers, of West Newton, Pa.

The Fuller Mfg. Co., of Moline, Ill., intend to erect a foundry, having a capacity of forty molders, in the spring of 1903 to supply itself with castings. The concern makes a specialty of manufacturing grain drills.

The recently organized New Castle Foundry Co., New Castle, Ind., is erecting a plant, the main building of which will be 60x120 feet, of brick with slate roof. The company at first will make only gray iron castings, but later it intends to include the manufacture of cast iron pulleys and steel ranges.

The Tioga Foundry Co., of Philadelphia, is building an addition 50x50 feet to its plant.

The Olympia Iron Works, Olympia, Wash., Z. C. Mason, proprietor, will shortly be enlarged by the addition of a foundry.

The Zanesville Malleable Iron Co. has commenced operations in its new plant at Zanesville, Ohio. The building is L shaped and contains a foundry 120x200 feet, engine and machine shop 80x110 feet, annealing room 80x106 feet and office 30x50 feet. The concern will produce air furnace malleable castings. R. H. Frees is president, J. D. Brennan vice president and general manager, and S. H. England secretary and treasurer of the company.

The Champion Steel Range Co., of Cleveland, Ohio, find themselves so pressed with business that they have decided to more than double their facilities by the erection of a large foundry and factory.

The Novelty Iron Co., of Canton, Ohio, has completed its new foundry building to take the place of the old one destroyed by fire last winter. The new foundry is built of vitrified brick and steel and has two cupolas with a melting capacity of 35 tons daily. Both the core and foundry departments are covered by 20-ton electric traveling cranes. The new addition will give employment to about 200 men.

The Clinton Burnham Foundry Co., of Milwaukee, Wis., is installing a department for the manufacture of crucible steel castings.

The Metal Bedstead Co., Tacoma, Wash., has been incorporated with Joseph L. Carman, of the Pacific Lounge & Mattress Co., as president and general manager. The new company is erecting a building 75 by 130 feet. The output will consist of iron and brass beds, and the factory will be the only one of its kind in the Pacific Northwest. The cost of the building and machinery will be $25,000.

S. G. Barker & Son, of Scranton, Pa., have begun the erection of a new plant, and it is their intention to have a most modern foundry and machine shop in every particular. This firm manufacture railroad track scales and mining machinery and castings of all kinds, and are one of the oldest firms in this region, having been established by the late S. G. Barker in 1847.

The A. & F. Brown Co., of Elizabethport, N. J., manufacturers of power transmission machinery and appliances, are extending their foundry.

Jeremiah J. Richardson has been appointed receiver of the Richardson & Morgan Co., manufacturers of furnaces, South Norwalk, Conn.

According to reports, the Fort Wayne Steel Foundry Co., Fort Wayne, Ind., recently incorporated, has purchased the plant of the National Steel Casting Co., at Montpelier, Ind., and will remove it to Fort Wayne at an early date.

The Crucible steel foundry of the Nortmann & Duffke Foundry Co., at Milwaukee, has been placed in operation.

The D. M. Sechler Carriage Co., Moline, Ill., is preparing plans for the erection of a foundry for the manufacture of all the small castings required in the construction of its wagons.

The capital stock of Deere & Co., Moline, Ill., manufacturers of plows, has been increased from $1,500,000 to $6,000,000. The additional capital is to provide for the changes which are made necessary by the expansion of business during the past two years.

The P. P. Emory Mfg. Co., Springfield, Mass., coppersmiths, brass founders and machinists, will erect an addition 50x120 feet.

The Standard Motive Power Co. is reported as having decided to locate its shops at Canal Dover, Ohio, in consideration of inducements offered it by that city.

The Lehighton Foundry & Machine Co., of Lehighton, Pa., which recently began the manufacture of steam and hot water radiators, has bought all the stock of the Calorific Heater Co., Allentown, Pa., including patterns and equipment. James Walp and Milton A. Walp, who have been conducting the Calorific Heater Co. for some time, will devote their time to selling the product of the Lehighton plant.

The Crucible Steel Casting Co., of Milwaukee, Wis., will build a new plant.

The Norway Iron & Steel Co., York, Pa., will increase its capacity by the erection of an additional foundry of the same size as the present one, 80x240 feet, and the installation of another 15-ton melting furnace.

The Columbus Malleable Iron Co., Columbus, Ohio, have completed their new plant consisting of a molding room, 60x212 feet; annealing and assorting room, 80x108 feet; core room, and pattern shop, 36x72 feet. The officers are: Chas. A. Klie, president and treasurer; H. T. Irvin, secretary and general manager. The plant is provided with an acid open-hearth furnace and fully equipped with modern appliances.

A foundry building of fire-proof construction will be erected at an early day by the Toronto Hardware Mfg. Co., Toronto, Ont.

It is announced that the Ohio Brass Co., of Mansfield, Ohio, will enter the manufacture of malleable iron on a large scale. Plans are now being prepared for a modern plant.

Work has been commenced upon the addition to the plant of the Giddings & Lewis Mfg. Co., Fond du Lac, Wis. The shop will be 60x248 feet. The company makes a specialty of sawmill machinery.

The Marion Machine, Foundry & Supply Co. is incorporated with a paid in capital stock of $25,000. The officers are C. E. Chamberlin, president, and Henry L. Erlewine, secretary and treasurer. The company is now erecting a large plant in Marion, Ind., and will do a general machine and foundry business. It will also deal in all kinds of new and second hand oil well supplies.

The Limberg Foundry & Enameling Co., of Cincinnati, has decided to erect a new plant. It will consist of two buildings, one 75x50 feet, to be used for office and warehouse purposes, and the other 75x215 feet, the latter to contain the foundry and enameling departments.

The Calcasien Iron Works & Mill Supply Co., Lake Charles, La., have been incorporated with a capital stock of $20,000 to manufacture boilers, castings and general mill supplies.

The Eynon-Evans Mfg. Co., of Philadelphia, is building additions to its foundry which include a melting room for 20 furnaces, one-story, 20x80 feet, and a two-story part, 20x60 feet, with cellar for sand storage. The ground floor will be used for metal storage and the second for employes' washroom. In connection with this extension it is also building a new core room, with second story for storage of core boxes, etc. These changes will enable the company to greatly increase the molding capacity of the present foundry, removing from it the furnaces and core making department.

The Richard Mfg. Co., Bloomsburg, Pa., will erect a new foundry, 40x150 feet.

The Woonsocket Machine & Press Co., Woonsocket, R. I., is building an addition to its foundry.

The J. A. & P. E. Dutcher Co., of Milwaukee, intend to build a new plant.

The Hickson Mfg. Co., Muncie, Ind., has been incorporated with a capital stock of $100,000, to manufacture iron and brass bedsteads, and has taken over the foundry and shops formerly operated by the Bell Stove Works. The officers of the Hickson Mfg. Co. are: E.

G. Hickson, president; T. J. Parish, vice president; C. H. Church, secretary and treasurer.

The Buckley-Hart Mfg. Co. has been incorporated at Detroit, Mich., with a capital stock of $40,000. The company will manufacture and sell brass, iron and other metal specialties, and have taken over the plant of the Crescent Brass & Iron Co. The incorporators are as follows: Jas. P. Buckley, Richard P. Joy, Robt. W. Hart, Henry P. Hart, and S. A. King.

The Colton Mfg. Co., Montpelier, Vt., intends to build a new brass foundry in the near future. The principal output of the plant is saddlery hardware.

The Union Brass Works, Boston, Mass., brass founders and finishers, have incorporated with a capital stock of $100,000. The company will make a specialty of faucets and fixtures. Gustavus A. Soderlund is president, and Charles E. Bowers, treasurer.

The Interstate Foundry Co., of Cleveland, has completed the structural work for and will shortly occupy its new foundry, designed especially for heavy castings. The structure is 140x300 feet, equipped with one 40-ton, one 25-ton and four 5-ton electric traveling cranes, with an extension runway enabling these to run out of the building at either end for loading and unloading purposes. The company is also erecting an addition to its light castings department, 140x200 feet.

S. H. Wood & Co., Baraboo, Wis., have succeeded the Baraboo Iron Works, Roy Miner having sold his interest to S. H. Wood. The business will be carried on as heretofore, the firm doing general machinery repair work, castings, sleigh shoes, etc.

W. F. Mosser & Son, Allentown, Pa., are building an addition to their foundry. The greater part of their output is machinery for cement manufacture.

The Chattanooga Implement Mfg. Co., Chattanooga, Tenn., maker of heaters, sad irons, etc., has extended its foundry to take care of increased trade.

Deeds have been filed conveying the Corliss Steam Engine Works, of Providence, R. I., from the International Power Co. to the American Machine & Ordnance Co., of Bridgeport, Conn., which was incorporated last spring with a capital stock of $10,000,000. The company is a consolidation of the American Ordnance Co., of Bridgeport, Conn., and several other gun and projectile concerns. Joseph H. Hoadley, president of the International Power Co., also heads the Ordnance Co.

The Johnston & Jennings Co., of Cleveland, Ohio, has begun operations in its new foundry, which is 110x300 feet in size and furnished with the latest equipment. Castings up to 50 tons in weight will be produced.

The Standard Foundry & Mfg. Co., of Cleveland, has purchased the old sad iron works at Chagrin Falls, Ohio, and proposes to erect an addition to this building to be used as a finishing department and will also erect a foundry, 136x400 feet, for its register and specialty departments. The Cleveland plant will be continued as heretofore.

The Morning Star Mfg. Co., of Napoleon, Ohio, has been incorporated with $50,000 capital stock by R. W. Cahill, A. B. Blank, A. J. Saulter, Otto Gaiman, E. N. Warden, and D. D. Donovan. The company will manufacture traction engines and separators, and a large factory will be erected, to which a foundry for general work will be added.

The plant of the West Allis Malleable Iron & Chain Belt Co., Milwaukee, Wis., has been placed in operation. The foundry is 70x208 feet in size.

The Caldwell Car & Mfg. Co. is a new concern which will do business at Caldwell, Ohio. A foundry is nearing completion.

A large bed of molding sand has been discovered near Lawrenceville, Va. It is being developed by H. C. Risdon.

The Hussey Mower & Implement Co., of Dublin, Ind., it is reported, has decided to move to Knightstown, Ind., through the inducements offered by the Merchants' & Manufacturers' Association of the latter place, who will build the plant, consisting of three brick buildings, each 50x175 feet, at a cost of $10,000, the property to be deeded to the implement company when it has distributed $100,000 in wages, not including the salaries of the officers and clerical force.

Bids are being received for the construction of an addition to the plant of the Chicago Malleable Iron Co., which was recently acquired by the International Harvester Co. The principal new building will be one story in hight, of brick construction, 150x250 feet. Plans are also being prepared for three additional buildings to be erected at the Plano division of the International Harvester Co.

A general foundry business will be conducted by the Aird-Platt Mfg. Co., of Watervliet (Troy), N. Y., which has been incorporated with a capital of $50,000. The plant will employ about 300 men. Two buildings will be

erected. One will be two stories 40x100 feet, and the other 180x300 feet. The directors of the new company are: Alanson A. Aird and Henry Aird, of Troy, and Elbert S. Platt and M. D. Schoonmaker, of Waterford.

The Brosius No-Treadle Sewing Machine Co. is erecting a foundry at Jackson, Tenn.

The Williamson Bros. Co., of Philadelphia, will build a large foundry at Aramingo avenue and Cumberland street.

The Baldwin Locomotive Co. has built a large foundry at Burnham, Pa., where the majority of its castings are to be made and shipped to the main works in Philadelphia.

Plans are being prepared for the remodeling of the A. E. Shorthill Co.'s foundry at Marshalltown, Iowa.

The Kimball Bros. Co., of Council Bluffs, Iowa, will erect a new foundry.

The Richards Mfg. Co. has been incorporated at Lake Providence, La., with a capital stock of $100,000 to operate a foundry and machine shop.

Henry Feeley will shortly begin operations in his foundry at Linden, Mich.

The Smeeths Copper, Brass & Bronze Co., of Chicago, is having plans prepared for a new foundry to be erected at 22nd street and Western avenue. The building will be 75x256 feet and with equipment will involve an outlay of $40,000.

The Ground Hog Plow & Foundry Co. has been organized at Clarksville, Tenn., with a capital of $50,000 by J. R. Rossiter, W. M. Drane, Jr., B. W. Macrae and H. C. Merrett. The concern will manufacture plows and deal in agricultural implements as well as carry on a general foundry business.

Heesen Bros. & Co., Tecumseh, Mich., are extending their foundry by a 70 foot addition the full width of the present shop.

The Ideal Heating Co., Oskaloosa, Iowa, is building a new foundry.

The Chattanooga Machinery Co., Chattanooga, Tenn., will build a foundry 60x120 feet, machine shop 100x150 feet, pattern shop 50x50 feet and a storage building 50x50 feet. Corliss engines will be manufactured.

F. & L. Kahn & Bros. have let the contract for an addition to their plant at Hamilton, Ohio. This will be 224x126 feet and is to be completed as soon as possible.

The Detroit Vapor Stove Co. will erect a new factory at Detroit, Mich., which will include a foundry 40x80 feet.

The Silver Bow Foundry & Machine Co., of Butte, Mont., has decided to remove its plant to Salt Lake City, Utah, where a site has already been secured. The cause of this is the reported determination of the Amalgamated Copper Co. to build a plant for the manufacture of such machinery as is used in its Montana mines and smelters. After removing to Utah the company will take the name of the Salt Lake Engineering Co.

The Colorado Steel Casting Co. has been organized with a capital of $500,000 to build a plant at Colorado Springs, Colo. Car castings and couplers will be made a specialty. The incorporators are John I. Franklin, C. F. Springer and J. K. Vanatta, and these, with F. J. Hobbs and J. F. Sanger, constitute the directorate for the first year.

The Taylor-Forbes Co. has been incorporated to manufacture radiators, boilers, furnaces, etc., and to carry on the business of foundrymen and machinists at Guelph, Ont. Capital $300,000. Incorporators: John McPherson Taylor, Adam Taylor, James Shields Taylor, and George Duthie Forbes.

The D. Clint Prescott Co., of Menominee, Mich., will build a $5,000 addition to its foundry.

The Southern Co-operative Foundry Co., of Rome, Ga., will enlarge its foundry so as to nearly double its present capacity.

The Goshen Foundry & Specialty Works have been organized at Goshen, Ind., with a capital of $50,000, by Charles T. White, Alexander McDowell and Philip Lawrence.

C. H. Wiegand has started a foundry at Monona, Iowa.

The J. G. Wagner Co., of Milwaukee, Wis., contemplate building a new foundry in the near future.

The Globe Foundry Co., of Cincinnati, have purchased a new site upon which it is intended to erect a foundry.

The James T. Clark Co., of Newark, N. J., has been incorporated to carry on the manufacture of edge tools and a general foundry business. The capital stock is $100,000.

The United Shoe Machinery Co. has decided to establish its manufacturing plant at Beverly, Mass.

The Philadelphia Stove & Iron Foundry Co., of Philadelphia, Pa., has been absorbed by the Philadelphia Stove Co., recently incorporated. Howard H. Dickey is president of the new company and Robert W. Trump general manager.

The Excelsior Tool & Machine Works, now

at 212 Spruce street, St. Louis, Mo., have purchased a site at Winstanley near East St Louis, Ill., upon which will be erected a foundry 65x120 feet and a machine shop 70x130 feet. Theodore F. Philippi is president of the company.

The Claysville Foundry & Mfg. Co. has been incorporated at Claysville, Pa. Mail matter should be addressed to Lindsey, P. O. A building 50x150 feet will be erected at once.

The Cleveland Steel Casting Co., of Cleveland, O., has increased its capital stock from $100,000 to $200,000 and will make additions which will more than double the capacity of the plant. A new Siemens-Martin reverberatory furnace will be put in with a capacity of 105 tons per day.

The Beaver Valley Metal Co. will erect a plant at New Brighton, Pa., for the manufacture of brass and bronze castings. The incorporators are George T. Hildebrand, W. D. Berry and J. H. Barton. Temporary offices have been established at 732 Frick building, Pittsburg.

The Findlay-Graves Foundry Co. has been incorporated at Buffalo, N. Y., with a capital stock of $30,000 by Robert G. Findlay and Charles Otten.

The construction of a brick foundry building 71x100 is contemplated by the South Park Foundry & Machine Co., St. Paul, Minn.

The Caldwell & Drake Iron Works, Columbus, Ind., have erected a plant and will soon begin operations therein.

Sampson Gray has been appointed receiver of the Norwalk Foundry & Machine Co., Norwalk, O.

Deaths.

Samuel A. Howland, formerly a well known New England iron founder, died at Hanson, Mass., on September 8, aged 74 years. During the Civil War Mr. Howland was engaged in casting heavy guns for the Government. Later he was connected with the Rhode Island Locomotive Works at Providence as superintendent of the foundries. In 1881 he became superintendent of the New Bedford Iron Foundry, remaining there ten years.

Thomas E. Chandler, formerly senior member of the firm of Chandler & Taylor, Indianapolis, died on September 10, at his home in that city. Mr. Chandler was 75 years of age. He was born in Lancaster, Pa., and in 1859 went to Burlington, Ia., to take charge of a rolling mill. He afterwards accepted the position of superintendent of a rolling mill at Indianapolis. It was while holding this position that he formed a partnership with Charles R. Wiggins, of that firm, and the new company was known as the Chandler and Taylor Company. Mr. Chandler bought out his partner's interest in 1864. A process for rolling and rerolling rails at one heating was invented by Mr. Chandler, but for the lack of financial encouragement he did not meet with the success of other men who took charge of the patent and made fortunes out of it.

B. K. Cook, foreman of the Portland Stove Foundry Co.'s plant at Portland, Me., died recently. He is succeeded by Frank J. Mitchell.

Henry A. Richardson, the founder of the Richardson & Boynton Company of Dover, N. J., died at his residence, Poughkeepsie, N. Y., September 16, in the eighty-fourth year of his age.

James Duffy, president of the Duffy-Trowbridge Stove Co., who recently died at Hannibal, Mo., was born in Ireland, November 11, 1827, and came to this country with his parents when a child. He was indentured as an apprentice in the stove molder's trade in 1841, and began work as a journeyman in 1846. In 1853 he went from Troy, N. Y., to Quincy, Ill., and worked as a stove molder in the foundry of what is now known as the Comstock-Castle Company, where he remained until 1863, when he engaged in business with Messrs. White and Bonnett. In 1866 the company were dissolved and Mr. Bonnett and Mr. Duffy built what was then the third foundry in Quincy. Mr. Bonnet drew out in 1884 and the Duffy-Trowbridge Stove Co. were organized. About 15 years ago the foundry was removed to Hannibal, Mo. When the company were organized Mr. Duffy was made the president, which position he retained to the time of his death. His long experience in the trade and his keen observation resulted in his bringing out many improvements in connection with stove making. The goods which his company turn out have enjoyed an enviable reputation, not only locally, but through an extended territory.

James W. Ainsley, for years a prominent foundryman of Louisville, Ky., died in that city Sept. 13.

George Coleman, one of the foundry foremen with the Westinghouse Machine Co., East Pittsburg, Pa., died Sept. 10, aged 40.

Pattern Metal.

To one who has had the varied experience of a jobbing brass foundry, it is a matter of considerable surprise that the patterns which are received with casting orders should be so diversified. For large patterns and those from which but a few castings are to be made, wood, of course, stands pre-eminent in its suitability for the purpose. It is the gated patterns in which so much difference exists not only in the manner in which they are made, but in the material itself. Now and then one encounters a wood gated pattern, hard rubber is frequently used and even celluloid has been noticed. As for the metals and alloys which may be found, cast iron, malleable iron, yellow brass, composition, aluminum and its alloys, gun metal, German silver, zinc, lead and antimony alloys, tin alloys, etc., etc., may be mentioned as those materials which are used in the art of pattern making. Some persons go so far as to nickel plate their patterns, others fancy that there is much virtue in a very thin coat of lacquer and, indeed, the writer once saw a gated pattern made from sterling silver. Just what virtue there is in a silver pattern could not be learned, but as it originated from a company which manufactured silver goods, part of the reason for its existence may be accounted for. Had a silver pattern any particular virtue, its use in the foundry would be accompanied with much difficulty, so that there is no doubt that one would soon return to other material.

Upon the first thought it would, perhaps, seem peculiar that one metal should possess better qualities than another for pattern work, but such is the case. It requires but a moment to realize the unsuitability of iron for this purpose. Its liability of rusting unless excellent care is taken of it, the difficulty of obtaining clean sharp castings true to the master pattern, the porosity and the fact that gray iron cannot be soldered to the runner, renders iron a metal which should not be used for a pattern. Aluminum is another material which, except for its lightness has nothing to commend it to the pattern maker. It cannot be soldered except with great difficulty, and even when a joint is made, the weakness of it is quickly manifested. The corrosion of the aluminum alloys by the hot moist sand is decidedly against it, and like iron is difficult to work. The low melting alloys such as those of tin, lead, or zinc are quite frequently used, and in some cases answer the purpose well. For habitual use and for patterns which require freedom from distortion, the employment of these alloys cannot be recommended. Their softness and inability to hold their shape, the great care necessary in soldering and the difficulty in finishing tend to eliminate these materials from the list of pattern metals.

The copper alloys now remain as those which are most suitable for pattern making and such metals as the aluminum bronze, aluminum brasses and other similar alloys are too difficult to solder to place then in the list of available materials. Even when a joint is made the strength is quite deficient.

Yellow brass and the copper and tin alloys are the ones which are by far the most suitable for this purpose, and the casting qualities of the latter are decidedly in their favor. Under the name of composition they are very extensively used, and while much depends upon the molder's art in producing smooth and perfect castings, yet unless the alloy is properly made of the right materials more or less difficulty will be encountered. If the alloy contains too much tin, the castings will be too hard to file to a finish, if the tin is lacking in amount, softness and inability to hold the shape will follow. A deficient amount of lead renders the alloy liable to clog the file while an excess produces unsound castings. Zinc is added to render the castings sound and homogeneous, but too much renders the surface of the metal rough from the smoke which is drawn in with the molten metal.

There are certain foundries which make a specialty of casting patterns, and it has been found that they are quite particular about the quality of the metal which they use. One founder, in particular, who has an excellent reputation for this class of work charges eighty cents per pound for the castings as they come from the sand. Quite a high price for apparently such simple work, but when it is found that he has a large sale, the reason for it must not be overlooked.

The writer some time ago made an analysis of the alloy which he was using for making the castings, and the following results were obtained, viz.:

Copper	90.02 per cent.
Tin	5.93 per cent.
Zinc	2.08 per cent.
Lead	1.36 per cent.
Nickel	.59 per cent.
Iron	.05 per cent.

It will be seen, therefore, that this alloy is practically a steam metal, but containing a little nickel; whether this nickel acts favorably or not is doubted. The author has obtained as good results, apparently, without the use of it.

If the alloy is found to be less hard without it, add the same amount of tin to that already in the alloy. It will be noticed that the lead is not excessive in the alloy but the amount will be found all that is required. The iron present is an impurity, of course. This alloy has been found to be a satisfactory mixture for pattern work, and one will be much pleased with the manner in which it casts and works. If it is desired to duplicate the alloy, the following proportions may be taken: Copper (new) 10 lbs., tin ¾ lb., zinc ¼ lb., lead 2 oz.

Too much stress cannot be laid upon the molding of this work for, even with the proper mixture, poor molding will spoil all.

A fine sand should be used, the molds skin dried and smoked with a gasoline torch. Pour the metal at as low temperature as possible and the work will come from the sand clean and bright. In fact with proper molding and proper metal but little finishing is needed on the patterns, a condition which speaks for itself.

For soldering use either a half and half solder or a two and one, i. e. two parts of tin and one part of lead. A solder rich in lead is not as good for this work and is liable to crystallize at the joint and thus weaken the union of the metal pattern and runner. The best results, however, are obtained by brazing, with half and half brazing solder, the pattern and runner.—Erwin S. Sperry in *Aluminum World*.

Typical Brassfounders' Alloys.

The general public have an idea that the brass trade is one, at least, in which there can only be a limited amount of trickery. In some quarters, anything having the *color* of brass will suit, even if it is mainly zinc; and in others, a metal having the color and fracture of gun metal is as good as the best. Yellow brass and gun metal are probably the two most prominent alloys on the brassfounders' list, but they have ceased to be the typical metals they were in the good old days before brassfounders knew more than one way of making them, unless in shops working to standard formulae and requirements, or where specifications and tests are part of the contract. I do not mean to infer by this that the brassfounder is degenerating, or that he has lost his cunning in mixing the alloys, but rather that the exigencies of trade, price-cutting and competition, have left him no other possible way out than by adulteration, or a skillful manipulation of the metals within the limits of his customers' specifications. The ideal has almost been attained in iron founding; cast iron will in all likelihood, soon be bought, mixed, and sold, *universally*, by desirable chemical standards, and the mechanical tests required will be got by methods of melting and casting. Surely if it is a desideratum to seek for exact proportions of the elements in various grades of cast iron, it is none the less necessary in different qualities of brass. It used to be that the quantities of zinc or tin periodically consumed were a sufficient index of the character of the work done in a brass foundry. Nowadays, when the brass refiner is a power in the land, and the habit of buying mixed metals, ingot, and scrap, has grown to be recognized as a necessary evil, the line cannot be drawn so easily which separates brass and gun metal, or the legitimate use of the cheaper metals in the manufacture of brassfounders' alloys.

Perhaps we cannot better illustrate this point than by giving the reply of a foreman brass molder, who, when asked to purchase a recent book dealing with "Brassfounders' Alloys," said: "What do I want with a book of mixtures, when all I get to mix is a bar o' lead and a barrel o' sojer's buttons?" Fortunately, this is an extreme case, and the resources of the average brassfounder are not confined to such puerile commodities. Nevertheless there is a suggestiveness about that "bar o' lead," which will appeal to the engineer or trader handling either marine or jobbing brass castings. It is due to the refiner to say that he has in great measure educated brassfounders and opened their eyes to new possibilities in the matter of serviceable alloys, high-tension alloys and alloys containing the "base" metal. The staple product of the brass refiner is known to the trade as *Ash Metal*. This is a low grade brass containing all sorts of impurities; it is reduced from skimmings, furnace ashes, "buffings" and sweepings, and when a sufficient quantity for a heat has been washed it is smelted and tested to see how much lead or zinc it will carry before being run into ingots for the market. Ash Metal has really no claim to the name of brass unless for its color, and then it sometimes might with equal justice be termed German Silver, and no self-respecting brassfounder would ever dream of using it for castings by itself. He generally mixes some other metal with it to give it body, or else he uses it as a cheap reliable adulterant in new metal. To the credit of the refiner it must be said, he makes no professions about his Ash Metal other than that it is *cheap*. The following is an analysis of a regular Ash metal sold

in Glasgow in 1900: Copper 57.08, tin 1.23, zinc 25.65, lead 14.12, antimony 0.42, iron 0.61. This is what is termed a "Proximate Analysis"; metalloids are not given.

The term *brass* has long been used to indicate an alloy of copper and zinc. Copper ranging from 60 to 90 per cent, and the early method of manufacturing it was by a process of cementation. The mineral calamine (zinc carbonate) was roasted in the presence of "shot" copper, and the alloy formed was distinguished by its full yellow color. This process could not be relied upon to give uniform results, however. The first attempt to produce brass by the direct admixture of spelter, i. e., metallic zinc, was made by James Emerson, who was granted a patent for his method in 1781. The improved methods of producing zinc, by distillation, and by deposition, have naturally led to improvements in the manufacture of brass itself. For example, the old method of mixing alloys in the brass foundry, was to melt all the ingredients in separate crucibles, and pour the volatile or more fusible metals into the crucible containing the molten copper. We cannot say that the modern method of pushing pieces of the metals forming the composition into the barely fluid copper is any improvement, but it certainly is not so troublesome, and with proper attention gives quite uniform results. The standard yellow brass is a 2 and 1 alloy. Centesimal proportions: Copper 66.66, zinc 33.34, but for convenience of casting or turning a small addition of lead or tin is made at the time of casting. Tubes and fine yellow brass show copper 70, zinc 30, while the ordinary plumber brasswork as cast in the Birmingham foundries averages copper 60, zinc 36, lead 4. Passing from yellow metal to red metal, or to give it the trade name, *cock metal*, is an easy transition. The components are the same, but the proportions of copper and lead are increased. The foundry practice in making cock metal is to add the zinc always in the form of yellow brass; this saves remelting and gives a more homogeneous alloy. The formula of a large firm dealing with this class of work for years, is Copper 50, Yellow Brass 45, Lead, 5. This has given great satisfaction for bib-cocks, screw-down cocks, and lavatory fittings, and has been tested to the standard pressures of all the large cities in Britain.

Many manufacturers manage to get along with an inferior quality of metal for this class of work but I do not think it is good practice. Lead has its legitimate use and place in the category of brassfounders' commodities, but when its low price and greater density are taken advantage of solely for the purpose of adding to the profits, then it becomes a source of great mischief and annoyance. On that account, I pass by the so-called "Pot" metal, and propose glancing for a little at the merits of a very much improved Cock metal, viz.: American *Steam Metal*. In recent years, Americans with characteristic enterprise have introduced many innovations and improvements in the making and mixing of alloys. Foremost amongst these we may mention the various kinds of self-hardening steel, the recent method of mixing foundry iron by analysis, and in the brass founding line, the almost universal adaptation of old formulæ to modern conditions. Bronze is a term which is used in contradistinction to brass, and indicates an alloy of copper and tin. The original ordnance bronze, copper 90, tin 10, was the best known alloy for withstanding shocks, besides being the strongest metal for many engineering pur-

TABLE SHOWING CONSTITUENTS AND RANGE OF BASIS ELEMENTS IN TYPICAL BRASSFOUNDERS' ALLOYS.

Name of Alloy.	*Constituents.*	*Basis Metal.*	*Per cent of average Content.*
Brass	Copper and Zinc	Copper	60 to 75
Brazing Metal	Copper and Zinc	Copper	80 to 90
Bronze	Copper and Tin	Copper	84 to 94
Bell Metal	Copper and Tin	Copper	78 to 84
Gun Metal	Copper, Tin and Zinc	Copper	80 to 90
Steam Metal	Copper, Tin, Zinc and Lead	Copper	80 to 90
Cock Metal	Copper, Zinc and Lead	Copper	75 to 90
Phosphorus Bronze	Copper, Tin and Phosphorus	Phosphorus	2 to 5
Aluminum Bronze	Copper and Aluminum	Aluminum	2 to 10
Aluminum Brass	Copper, Zinc and Aluminum	Aluminum	2 to 5
German Silver	Copper, Zinc and Nickel	Nickel	15 to 25
Delta Metal	Copper, Zinc and Iron	Iron	1 to 3
Manganese Bronze	Copper, Zinc, Iron and Manganese	Manganese	0.5 to 2.5
Silicon Bronze	Copper, Tin and Silicon	Silicon	0.5 to 2.5
Hard Solder	Copper and Zinc	Copper	48 to 55
Soft Solder	Tin and Lead	Tin	50 to 75
Anti-friction Metal, Grade I	Tin, Antimony and Copper	Tin	80 to 90
Anti-friction Metal, Grade II	Zinc, Tin and Copper	Zinc	60 to 80
Anti-friction Metal, Grade III	Lead, Antimony and Copper or Tin	Lead	75 to 82
Britannia Metal	Tin and Antimony	Antimony	8 to 10
Type Metal	Lead and Antimony	Antimony	10 to 20
Fusible Metal	Bismuth, Lead and Tin	Bismuth	15 to 40

poses, and *Gun Metal* was the name sacredly applied to this particular mixture. Nowadays gun metal is a term of great latitude, and it is quite possible to make gun metal which will satisfy the most urgent demands of engineering, with an admixture of zinc and lead. The British admiralty do not countenance the use of lead in gun metal alloys, but America is not so conservative, and it has been the common practice there to introduce a small proportion of the "base" metal into gun metal alloys intended for high steam pressures. The wisdom of this procedure was questioned for a long time, but experience has amply proved the fact that it is quite possible to produce with copper, tin, zinc and lead, a close grained metal which will cast well, machine easily, and withstand the highest pressures required in modern steam boiler mountings. Steam metal is the characteristic name given to this alloy; the average mixtures contain copper from 85 to 90 per cent, tin 4 to 8 per cent, zinc 4 to 6 per cent, and lead 1 to 3 per cent, a typical alloy being: copper 87, tin 6, zinc 5, lead 2.

Another metal in which lead plays a most important part is known as *anti-acid metal.* It is well known that nearly all acids, and for that matter, alkalies, too, dissolve or corrode metals and alloys at ordinary temperatures, and with an increase of temperature this corrosive action is generally accelerated. By many of the newer metallurgical methods the products are obtained by the "wet" process, from solutions of the ores in the presence of acids. The gain in by-products is considerable, and the time and outlay required to reduce a given quantity of metal is generally less than by the old roasting methods.

This was brought under my notice in conducting a series of experiments for an Australian copper mining company. Several trials of alloys were made in order to test which would best stand the action of sulphuric acid—one of the by-products in the manufacture of copper at this mine. It is well known that where rubber or vulcanite cannot be used for fittings for sulphuric acid vats or cisterns, lead is the next best material available; but lead alone will not bear sufficient strain to allow of its being employed for machine parts, and therefore it is customary to alloy copper and lead for these parts to give them the necessary strength. Alloys of copper and lead do not combine well; they are subject to liquation, and antimony is frequently added to help "carry" the lead—this is a common dodge in the manufacture of "pot" metal. The mine referred to was fitted up with an installation of the well known Worthington pumps, working at a nominal pressure of 80 pounds per square inch. The steam end of these pumps was all cast iron, but the water end, through which a solution of copper sulphate had to pass was made in the first instance, from a special anti-acid metal composed of copper 63 per cent, lead 30 per cent, antimony 7 per cent. This proved a very satisfactory alloy for the purpose, but some of the parts which were subject to friction or stresses, such as the plunger, the seats, or the ram, gave out in a short time, and to improve the wearing qualities of these parts a new alloy was made, containing: copper 70 per cent, lead 20 per cent, antimony 7 per cent, tin 3 per cent. Even this mixture did not give complete satisfaction, the conditions were severe and exacting—vibration, continuous working, and heavy load—and after one other trial with a modification of the last alloy, the engineers fell back upon a gun metal containing lead, which has proved useful in bearings and frictional parts of machinery, viz.: Copper 85 parts, tin 10 parts, lead 5 parts.

Many of the modern alloys, such as phosphor-bronze, aluminum-bronze, etc., which have passed the embryo or novelty stage, may be reckoned amongst the typical brassfounders' alloys. Anti-friction metals, too, deserve more than a passing word. Meanwhile, the appended table should define clearly the nature and ingredients of the various alloys common to the brass foundry.

JOHN F. BUCHANAN.

A Bulletin of Foundry Information.

I have recently had the pleasure of reading a very interesting pamphlet, published by one of our leading supply houses. While we have used large quantities of their goods, and found them at all times to be first class, I must for once say that I consider this bulletin the poorest article they have ever gotten out.

It has undoubtedly been the intention of the promoters of this scheme to benefit the molder, to make him think and take more interest in his business, etc. Too much praise cannot be given to anyone with such a laudable object in view, and I am quite sure that all interested in the foundry business will wish them success. Being a foundryman and a practical molder, I feel that a few remarks from me will not be out of order.

In the first place let us bear in mind that

we cannot successfully impart knowledge to others, if we persist in proving to them that they are about as ignorant as it is possible for them to be. In teaching a child to walk, we do not begin by telling it that it cannot walk, but we insist that it can walk. Which has the better effect, the encouragement or the doubt? So it is in the foundry and such a list of questions and answers as have been published in this bulletin under the head of *Pig Iron* would certainly be very discouraging, if not degrading, to the few molders who may not understand just what pig iron is. In the natural course of things the same would also be treated with contempt by the majority who are posted. For instance, the first question is: What is pig iron? The supposed molder's answer is "pig iron." The chemist's answer is "the product of ores reduced in the blast furnace."

Now to the ignorant or the wise, which is the more intelligent answer? The chemist's of course. If we did not have him to tell us that pig iron was produced in a blast furnace, the poor molder might be under the impression that pig iron was made in a cheese factory or a brewery.

Another question is: What are its component parts? The molder answers "why pure iron," while the chemist says it is "about 90 per cent metallic iron, the remaining 10 per cent consisting of silicon, phosphorus, manganese, sulphur and carbon."

To the other questions: What is silicon? What is phosphorus? What is manganese? the author of the Bulletin has given the molder's answers as "I don't know." When a moldert is asked: " What is sulphur?" he is said to have answered "Brimstone," while the chemist claims it to be "the most dangerous element, etc."

I believe there is hardly a molder in the business who does not know that sulphur is the most dangerous element he has to contend with both in the iron and in the coke.

There is also the question "what is carbon?" The supposed molder's answer is "coal," while the chemist gives a brief description of graphite and combine carbon.

There are several other questions and answers, all of which attempt to show that the chemist is endowed with an unlimited store of knowledge, and try to make the molder appear as one who knows nothing whatever of his own trade.

As a molder I protest against such assertions. I believe it requires more brains and more originality in the molding trade than it does in the chemist's vocation.

Every successful foundryman is to a certain degree a chemist. He may not have a well equipped laboratory, or be the author of many lengthy tests and analyses of different mixtures, etc., but he will have in his possession the analysis of every car load of pig iron he receives, and his practical knowledge of molding enables him to intelligently produce mixtures which meet every requirement.

I do not mean to say that the chemist is of no benefit to the foundry, but I do say that he can be of more benefit to his employers and the foreman if he is stationed about one-quarter of a mile from the foundry. Then the test piece, representing each heat or each casting, can be sent to him daily if desired.

He can then furnish the company and the foundry foreman with a complete record showing the different mixtures, and the result of the tensile, transverse, chill, drop and shrinkage tests, also the analysis. In this capacity he is all right, but to place him in charge or in authority in the foundry would be like sending a ship to sea without a rudder.

While chemical analyses are a strict essential to the foundry foreman, they give very little information as to how to build a flask, a core oven or how to charge a cupola. They will not tell one how to set a core or carry off a vent, cut a gate, place a riser, make a core arbor, construct a pattern or handle men. For this reason the chemist can accomplish more good as a servant of the foundry than as a manager. This being the case, I do not consider it fair to give the chemist credit for possessing more knowledge of the foundry than the molder. Another item can be found in this Bulletin under the head of "what is the difference," which reads thus: "Lots of foundrymen do not realize the advantage of having proper tools to work with." With reference to this I consider the author in error, as molders, foreman and owners all realize the benefit derived from proper appliances, but in many cases they cannot get what they want.

Every improved machine or appliance sold by the supply house is not an improvement in every foundry.

In conclusion I want to say that my reason for making these remarks is simply a desire to protect the molder. I consider the molder one who accomplishes more with fewer facilities than any other mechanic, and I believe more originality and brains is required to be a suc-

cessful molder than is necessary in any other trade. I have a large number of molders working for me, and with the exception of a very few they make the foundry business a careful study, including iron mixtures and cupola practice.

It does me good to go among them and discuss better methods of working, methods that tend to improve the output, etc. Being in close touch with these men, and knowing what I do of their ability and desire to improve the condition of the shop in the way of better work, I feel called upon to repudiate any statement that I consider would depreciate the worth of the molder in the eyes of those who may not thoroughly understand foundry practice.

PAUL R. RAMP.

Personal.

Edward B. Gilmour has been placed in charge of the Acme Harvester Co.'s foundry at Peoria, Ill.

It is reported that the active management of John Rice & Bros. Co.'s plant at Stevens Point, Wis., will be taken up by Fred. M. Milberry.

The foundry of J. Thompson & Sons Mfg. Co., Beloit, Wis., is now presided over by W. A. Jenkins.

J. S. McDonald has accepted the foremanship of the foundry connected with the plant of the Jas. Morrison Brass Mfg. Co., Toronto, Ont.

F. S. Cadwell, well known to the trade as a seller of soapstone and other necessities of the foundryman, has reformed and is now superintendent of the Michigan Heater Co., Big Rapids, Mich.

Joseph J. Wilson, for a number of years a foreman in the Farrel foundry, Ansonia, Conn., has accepted the position of superintendent of the Leland & Faulconer Mfg. Co.'s foundry, Detroit, Mich.

T. P. Kelly has returned from an extensive trip through Great Britain and the continent of Europe. Rumor has it that he scaled several Alpine peaks

M. McLeod has accepted the position of superintendent with the Clinton Burnham Foundry Co., Milwaukee Wis., and will look after affairs in the crucible steel casting department, now being added to the plant, as well as the gray iron foundry

Thomas Markey, foreman of the Atlas Engine Co.'s foundry at Indianapolis, Ind., has resigned to become manager of the recently incorporated Shirley Radiator & Foundry Co., Shirley, Ind. He is succeeded at the Atlas shop by James Conners.

The foundry of the Allfree Engine Co., Indianapolis, Ind., is now in charge of Scott Winters, who has been selected as foreman.

Micheal Colligan, who was formerly foreman of the Niles Tool Works foundry at Hamilton, Ohio, is again occupying that position.

Rodger Malley will preside over the new foundry lately added to the plant of the Superior Gas Engine Co., Springfield, Ohio.

Andrew Bruce has accepted the position of foundry foreman with the Thomas Mfg. Co., Springfield, Ohio.

Paul G. Rahe has resigned as manager of the Central Foundry Co., Vincennes, Ind. He is succeeded by Wm. H. Stockham.

J. B. Orbison has resigned as manager of the Southern Foundry & Machine Works, Fredericksburg, Va., to accept a similar position with W. T. Garrett & Co., San Francisco, Calif.

Richard Walsh has been selected as assistant to general superintendent T. R. Pickard, of the Bass Foundry & Machine Co., Fort Wayne, Ind

The Snider-Hughes Co., manufacturing pumping machinery, has broken ground for its new plant at Cleveland, O. The machine shop will be 80x200 feet and will be completed as soon as possible. A pattern building 50x100 feet is also to be erected as well as a foundry 60x120 feet which will not be built until spring.

The McClary Mfg. Co., of London, Ont., will shortly erect a new plant for the manufacture of stoves to consist of a molding shop, mounting shop, power and storage house, a polishing shop and other smaller structures. It is reported that the foundry will be one of the largest in Canada, measuring 200x230 feet in area. The mounting shop will be 75x300 feet and the other buildings in proportion. The new plant will be conveniently located as regards to shipping facilities and will give employment to something over 400 hands.

The Barnard & Leas Mfg. Co., of Moline, Ill., maker of mill and elevating machinery, magnetic separators, etc., intends to erect a new foundry in the near future.

Thos. Bailey & Co., of Athens, Ga., will enlarge their foundry.

It is reported that the Anderson Foundry & Machine Co., operating plants at Anderson and Ellwood, Ind., contemplates enlargements at both points.